AMERICAN MACHINIST

April 17, 1940

Double Duty—*This grinder guard serves also as a lighting fixture—one of the many ways of casting candlepower where it will do the most good*

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ARTHUR JOHNSON, *Tool Supervisor*
Cutler-Hammer, Incorporated
Milwaukee, Wisconsin

"I get as much out of the advertising in *American Machinist* as the articles . . ."

WHAT'S IN THIS ISSUE

LIGHT ON THE SUBJECT

It's no wonder we were a pushover for the candid camera craze when it burst upon the national consciousness. Ever since our high-school days we've been fascinated by the subject of light—what it is, how it acts. As a result we've followed pretty closely most of the lighting developments we've been able to keep in touch with, be they for photographic, domestic, stage, highway, ornamental or industrial applications.

Progress in industrial lighting has been pretty steady, if not spectacular. Development of reliable light meters proved one of the major factors in improving industrial lighting conditions. Since lighting experts have had this useful tool they've done better and better jobs of providing the right amount of light in the right places. For a while it did cause a little too much attention to be focused solely on the question of brightness, but now illumination engineers are again concerning themselves with all the variables and are turning out lighting installations individually tailored for each given task. New fixtures developed for specific purposes help a lot. How a given seeing task is approached, and what is done next, is discussed by Dean M. Warren, of General Electric's Nela Park Lighting Division, in the story beginning on page 235.

DEAN M. WARREN

GRINDING ONLY

Sharpening all the production tools used in an automobile plant is in itself a monumental task. All the problems ever encountered in most toolrooms, plus quite a few more, have to be solved as a matter of course. Packard has taken an unusual step in segregating its tool and cutter *grinding* operations from the rest of its tool maintenance work. It seems to us the advantages achieved could also be gained by others having similar problems, even if on a somewhat smaller scale. So on page 238 we've included a detailed layout of the new set-up, along with a detailed discussion of the whys and wherefores.

SHIPSHAPE

Of all the places in the world where you wouldn't expect to find line production methods, a shipyard is probably the most obvious. Yet such is the versatility of the flame-cutting process that it has been applied successfully, by two yards at least, to line-production shaping of ship plates. They've worked out an arrangement which could be duplicated profitably in many a shop we know of. On page 240 are the details.

MORE ABOUT GUERIN

In our last issue we got pretty well acquainted with the Guerin process. This time we go a step further and dig up the details as to what actually happens when metal is formed by this "rubber stamp" method. A few rather wierd things take place. On page 246 Henry Guerin himself tells about them.

HELICAL

Calculating change gears for cutting spurs isn't much of a problem, but when it comes to helicals, that's something else again. The tough part is the conversion of a terrific decimal into its corresponding fraction, the accuracy of the lead angle depending directly upon the accuracy with which this conversion is made. A streamlined method of figuring this has been worked out, and can save a lot of time when calculating change gears by longhand methods. On page 249 James W. Dudley, of Illinois Gear & Machine Company, explains the procedure in detail. If you ever cut helicals, take a look.

EASY DOES IT

Some people's opinion of Dale Carnegie is unprintable. Others rave over him. Neither group stops to think, apparently, that most of the tactics he suggests are a decided help in reducing the friction of daily contacts. "But not in the shop," you say. "That's one place where you've got to show 'em who's boss." We're not not sure. Shop men appreciate tact and consideration as much as anyone. And they show it, with enthusiasm which can literally transform the shop —and boost its output. Why not see if Josef N. Peterson's "real-life drama" on page 251 couldn't be enacted in your own shop?

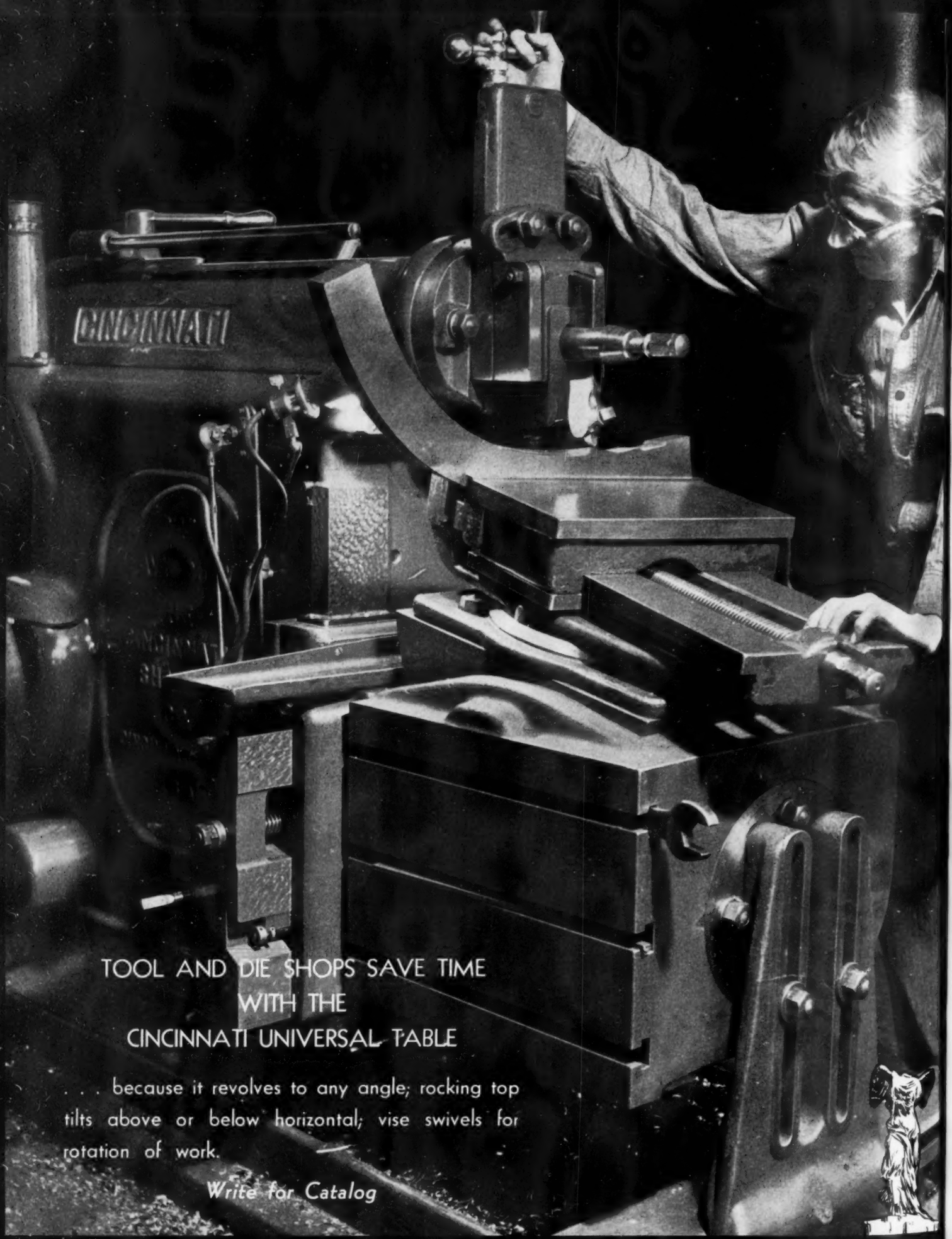
BEHIND THE SCENES

Whether a photography fanatic or not you'll enjoy the story on page 252. In it Marvin M. Black takes you behind some of Hollywood's scenes and reveals a few things that never find their way into the popular press. Maintaining equipment in proper condition, and often constructing special machinery for various effects, is the subject on which he focuses his editorial lens.

COMING

Jigs for oxy-acetylene welding are usually contraptions the operator tacks together when worst comes to worst. But certain fundamentals do underlie their construction. John Haydock, AMERICAN MACHINIST's managing editor, searched far and wide for information on their design, emerged victorious, told all to the International Acetylene Association last week. What he found out will be revealed in an early article.

Now in the death struggles with the printer is another one of our "extra dividends," this time a special material section dealing with the working of magnesium-base alloys. It will contain twelve pages crammed with what we believe to be the most concentrated collection of data ever assembled on the properties and machining of these metals, which are so rapidly gaining in importance in the metal-working industry. Look for it in the next (May 1) issue of AMERICAN MACHINIST.



TOOL AND DIE SHOPS SAVE TIME WITH THE CINCINNATI UNIVERSAL TABLE

. . . because it revolves to any angle; rocking top tilts above or below horizontal; vise swivels for rotation of work.

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ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

Lighting–tailored to the task

BY DEAN M. WARREN, NELA PARK ENGINEERING DEPARTMENT, GENERAL ELECTRIC COMPANY

Good lighting is reflected in better workmanship. It makes a greater percentage of man's energy available for his job

WHEN PROPERLY TAILORED to the job, artificial lighting will improve visibility, make work easier and reduce eyestrain and fatigue.

There are four fundamental factors that link a worker to his visual task: (1) size of the object or detail to be seen, (2) contrast of the object with its surroundings, (3) brightness of the object, and (4) the time it takes to see.

These factors are so interconnected for any individual and his task that within practical limits any three of them can be set for him and the fourth determined. For example, we could assume a scratch mark (size) on a piece of steel (contrast) lighted to 20 foot-candles (brightness) and for any individual the time necessary to see it could be determined. In most cases the size of the object and its contrast with a background are determined by the character of the work. That leaves brightness (foot-candles) and time (production speed) with which to work.

When brightness goes up, the time necessary to see goes down, provided the lighting is of the proper quality, and vice versa. Since time is an important factor and it is desirable to keep seeing intervals at a minimum, high-level lighting of good quality should be provided.

Adequate *general* lighting is the first essential. Such lighting not only

Good general illumination is the first essential of effective lighting. Supplementary lighting, in this case from a 150-watt projector providing 100 foot-candles on the work, boosts illumination of the work area

minimizes shadows but also enables every square foot of floor space to be utilized for work tasks. It might well be termed base lighting. To this is then added *supplementary* lighting for those tasks which require higher illumination than can be economically provided by the general lighting alone.

In every case this supplementary lighting should be virtually tailored to fit the particular seeing task. There are two types of lighting equipment for providing it—small, relatively concentrating units to augment general lighting over restricted work areas, and large-area, relatively low-brightness units which may also serve as general lighting systems for restricted areas such as work benches and inspection tables.

There are many different types of concentrating units available which will provide high-level directional lighting. They should be properly louvered so that they will not be glaring when viewed at the usual angles. Units of this type may either be attached to the machine or mounted on the wall or ceiling. In the latter locations they are out of reach of the workmen and thus are not readily disturbed once they have been properly aimed. One type of unit for attaching to machines or work benches is designed to eliminate, as far as possible, direct glare. This unit is deep, and the sides are therefore very effective in shielding against glare.

Large-area diffusing units were developed as a result of studies made by the Illuminating Engineering Society which revealed the need for sources of this type. They take many different forms. One consists of a luminous element of white diffusing glass mounted in a box containing lamps. Another is in effect a matte-white suspended ceiling illuminated by a trough reflector below the ceiling element. A third consists of the same type of suspended ceiling illuminated by silvered-bowl lamps placed below it. A fourth employs a bank of fluorescent lamps with suitable reflecting surfaces to insure reasonably uniform brightness. These units are usually mounted from three to five feet above the work.

"Mike" Used for Test

One of the many studies made by the Illuminating Engineering Society was lighting for machining small metal parts. A test was made on the visibility of a convex scale illuminated by various qualities of lighting. The micrometer caliper was selected for the experimental work because of its universal use in metal-working, its portability, and its similarity to the majority of seeing tasks encountered.

Best visibility is obtained when the source is of large area and low brightness, so that its reflection on the micrometer is a band wide enough to form a uniformly bright background for the markings. With the same candle-power provided by a concentrating source, the appearance of the micrometer barrel is quite different. The reflection of this source is a narrow, brilliant band which obscures the markings because of the harsh reflected glare.

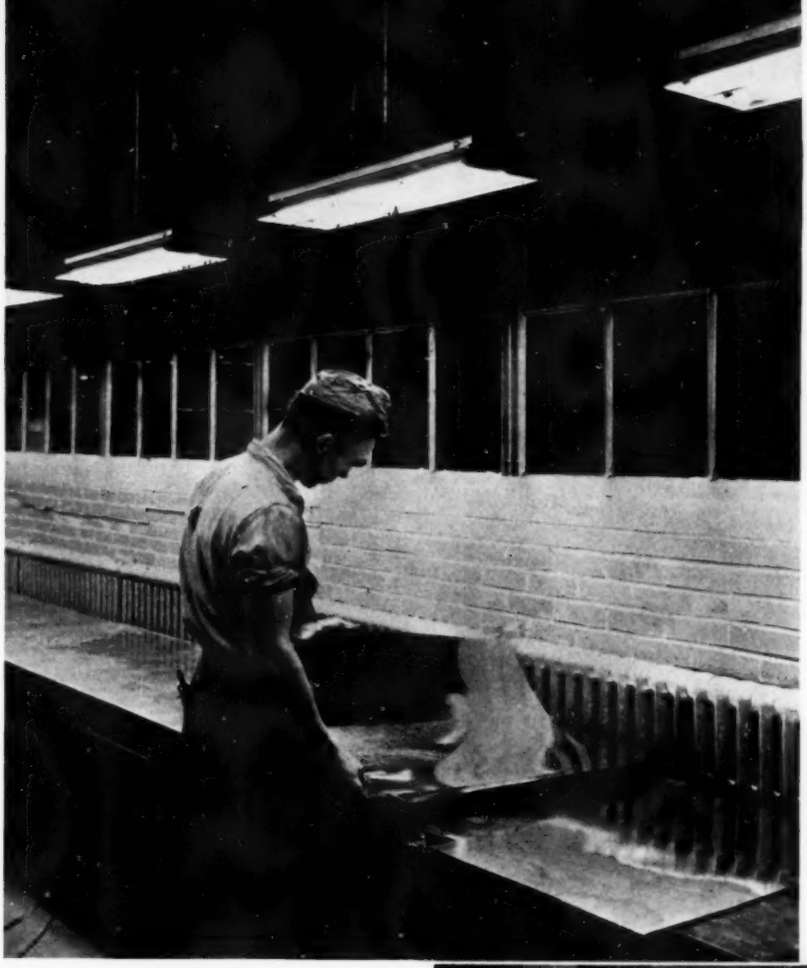
Where supplementary lighting is employed it is necessary to provide sufficient general lighting to avoid uncomfortable contrast between the well lighted work and the surrounding area. A worker involuntary glances away from his work at frequent intervals for momentary relaxation, and his eyes should not be penalized by having to make rapid changes due to wide variations in the lighting. For if the contrast is too great, the eye rapidly becomes fatigued from repeated adaptations of the retina and pupil to the widely different brightnesses encountered.

Though no two sets of conditions are exactly alike, in general the brightness ratio from maximum to minimum should not exceed 10 to 1. While measurement of foot-candles is not an accurate determination of brightness, it suffices in most cases; hence the common statement that with supplementary lighting the ratio of maximum to minimum foot-candles should not exceed 10 to 1. Thus for every 100 foot-candles of supplementary lighting provided, there should be at least 10 foot-candles of general illumination.

How much supplementary lighting should be provided for quick and efficient seeing? As may be expected, the amount varies with the severity of the visual task. These tasks may be divided into three classifications:

1. Tasks involving discrimination of extremely fine detail under conditions of extremely poor contrast for long periods. Examples are extra-fine bench and machine work, grinding, and extra-fine hand painting and finishing. To meet these requirements, levels of 100 or more foot-candles are required. A combination of at least 20 foot-candles of general

Numbers on a micrometer barrel are hard to read under concentrating-type supplementary light source, left. When lighted by a large-area source, excellent legibility is obtained because of considerably improved contrast



Though designed originally as supplementary sources, large-area diffusing units can serve as the entire lighting system, provided proper spacings and adequate lengths are used. Their light quality is similar to that provided by most types of indirect lighting

tions of better than average contrast for intermittent periods. Examples are repair and working departments in garages, fine bench and machine work, and fine sanding and finishing. Illumination required is from 30 to 50 foot-candles. In some instances it may be provided from a general lighting system. Frequently, however, it will be found more economical and equally satisfactory to provide from 10 to 20 foot-candles from the general lighting system and the remainder from specialized supplementary lighting.

In planning a combination system of general plus supplementary lighting, not only must a sufficient amount of light be provided but care must also be taken to see that the lighting is of proper quality.

There is a good solution for every industrial seeing task. To find it requires first of all a thorough analysis of the task, of what must be seen and how it is best seen, and then providing the quantity and quality of light required for safe and comfortable seeing. This is really tailoring lighting to the task.

Over 50 foot-candles of well diffused illumination is provided by the large-area low-brightness source overhead. In addition, a concentrating source gives more light from just the right angle for each particular job. Proper design keeps it from glaring into other workers' eyes when aimed correctly

lighting plus specialized supplementary lighting is therefore necessary.

2. Tasks involving discrimination of fine detail under conditions of fair contrast for long periods. Examples include buffing, polishing, automobile assembly lines and fine inspection jobs. Illumination levels of from 50 to 100 foot-candles are required. A combination of 10 to 20 foot-candles of general lighting plus specialized supplementary lighting is needed.

3. Tasks involving discrimination of moderately fine detail under condi-

For tool grinding only

Packard has set up an entire department solely for grinding tools and cutters. Its advantages can be applied elsewhere

PACKARD MOTOR CAR COMPANY'S new centralized tool and cutter grinding department has been laid out to concentrate like operations and expedite flow of work. During the production season, this department must recondition about 2,600 tools a day on a three-shift basis. By bringing scattered facilities together under one head, better and faster service is rendered to the producing divisions.

Dull tools of all kinds are trucked to the grinding room in boxes bearing production-department symbols. Small tools are unloaded at the receiving bench, which is divided into sections for the respective departments. Squad leaders route small tools to the appropriate machine sections for reconditioning and see that they are brought back for inspection. Large broaches and cutters are trucked directly into the proper resharpening sections to avoid extra handling.

In section *A*, on the floor plan, inserted-blade tools, except those ganged on arbors, are placed on benches for resetting blades and for replacing blades broken or too short for further grinding. Tools are reground in universal-grinder section *G*, backed off in section *P* and sent to inspection.

In section *B*, arbors with ganged cutters are disassembled on a bench and the cutters sent to the universal-grinder department, next to the backing-off section, then returned to section *B* for assembly, and finally sent to inspection. Side cutting edges of inserted blades in ganged cutters must be parallel to the arbor boss face and at right angles with the arbor hole to maintain accuracy in production. While being ground, each cutter is held on an annular ring with the sides ground accurately parallel. A clamping bolt passes up through the center of the ring and through the arbor hole in the cutter.

All hobs used in the plant are ground on four Barber-Coleman hob grinders in section *C*. Four Brown & Sharpe surface grinders in section *D* sharpen single-point tools, form tools and inserted cutters.

Threading tools and miscellaneous work are handled in section *E*.

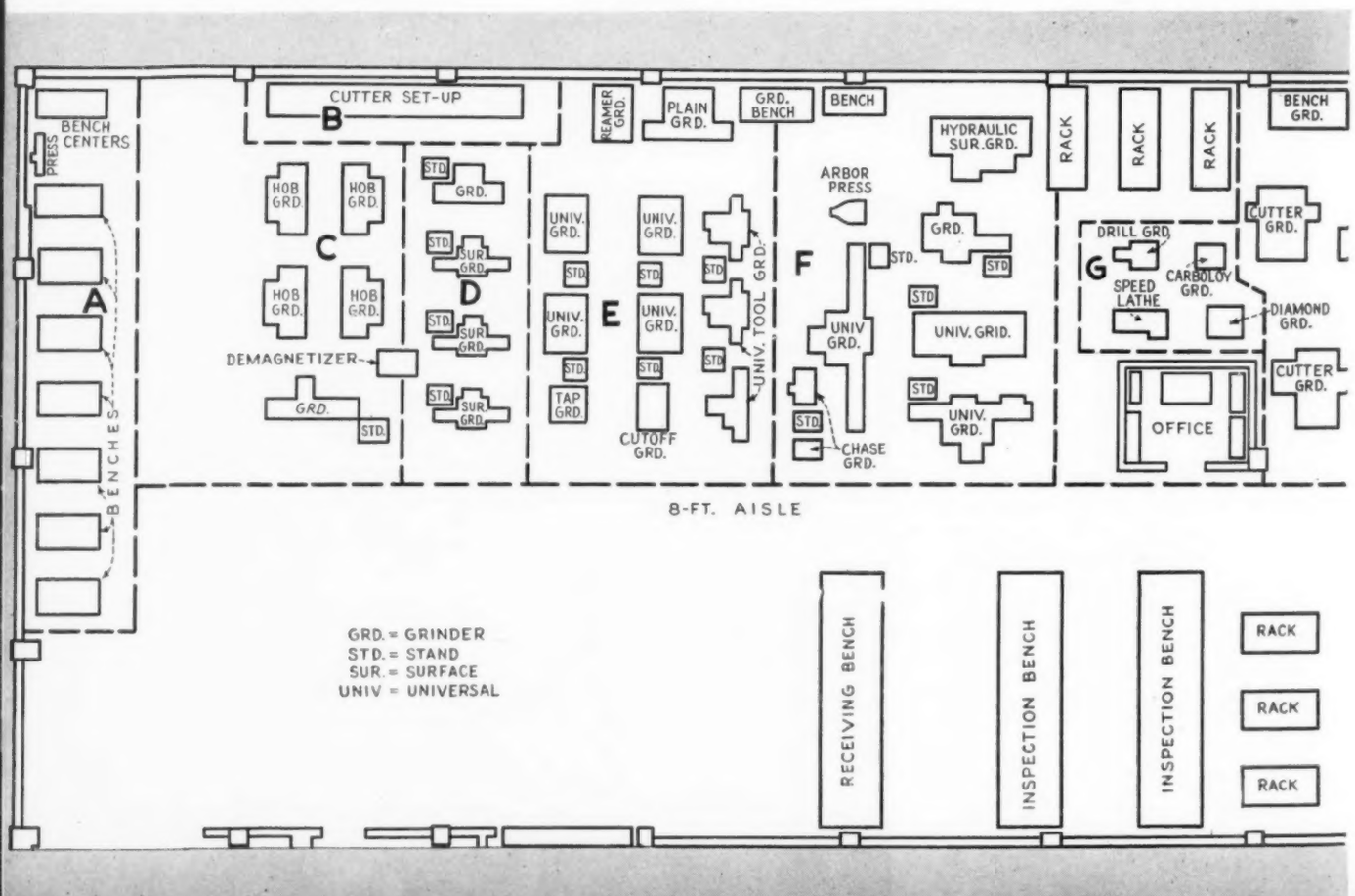
In section *F*, four Brown & Sharpe universal grinders are used for miscellaneous work. Two machines are set up for expansion reamers and general external work, a third for internal work and the fourth for cemented-carbide tools exclusively.

Cemented-carbide single-point tools and drills are reconditioned in section *G* on a Carboloy grinder, an Ex-Cell-O diamond wheel grinder, a drill grinder and a speed lathe.

All Ingersoll cutters for blocks, cylinder heads, flywheel housings and manifolds are ground in section *H*. These large cutters are delivered direct to a rack with vertical wood partitions. A monorail and air hoist are used to lift cutters onto a bench for resetting or replacing blades, next to either of two Heald rotary surface grinders and thence to a demagnetizer. Cutters are then placed on the Ingersoll cutter grinders and finally sent to inspection.

Broaches, both flat and round, are sharpened in section *I*. A chain hoist lifts heavy broach holders onto a bench for disassembly. The flat broach itself is sharpened on a large Thompson surface grinder. If necessary, flat broaches are recut on two revamped Oakley grinders equipped with vertical Ex-Cell-O spindles. Round broaches are reconditioned on a Colonial or Brown & Sharpe grinder.

Bandsaws and circular saws are



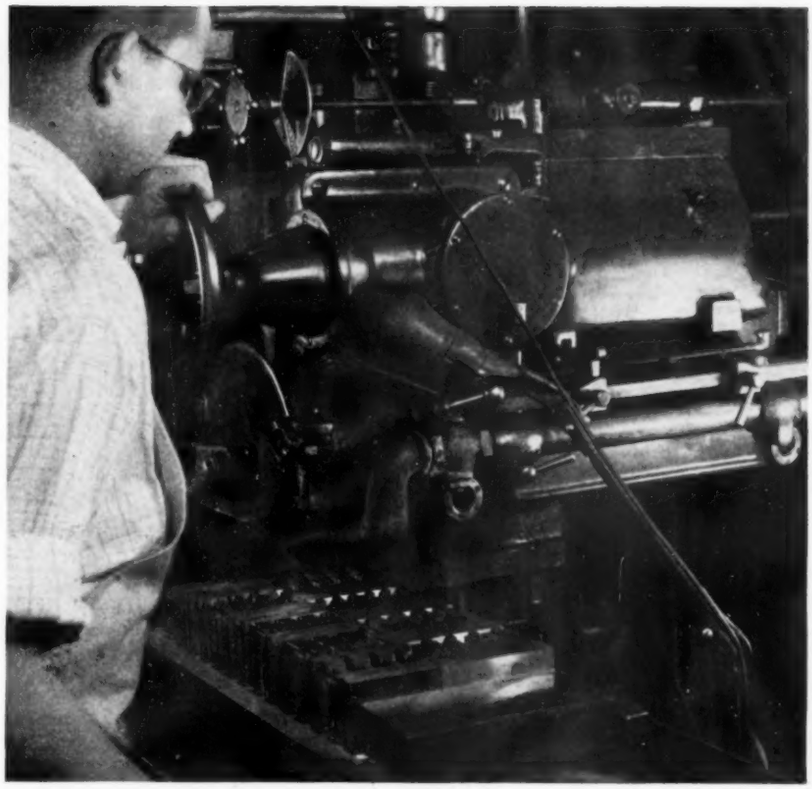
sharpened in section *J*. Circular saws are reground on two automatic machines. In section *K*, high-speed steel, single-point tools are reground on two Lumsden and three Tabor grinders. The former, being faster, are used solely for crankshaft and camshaft turning tools. The Tabor machines regrind tools used for turning gear blanks, axle shafts, cross-arm shafts and work of similar nature.

In section *L*, about 85 Fellows gear-shaper cutters are ground in three shifts.

All backing-off work is segregated from the rest of the grinding room, in section *M*. Since the work is done dry it is desirable to keep this work to itself because the exhaust connections can be laid out more efficiently and any escaping dust is not thrown into other machines.

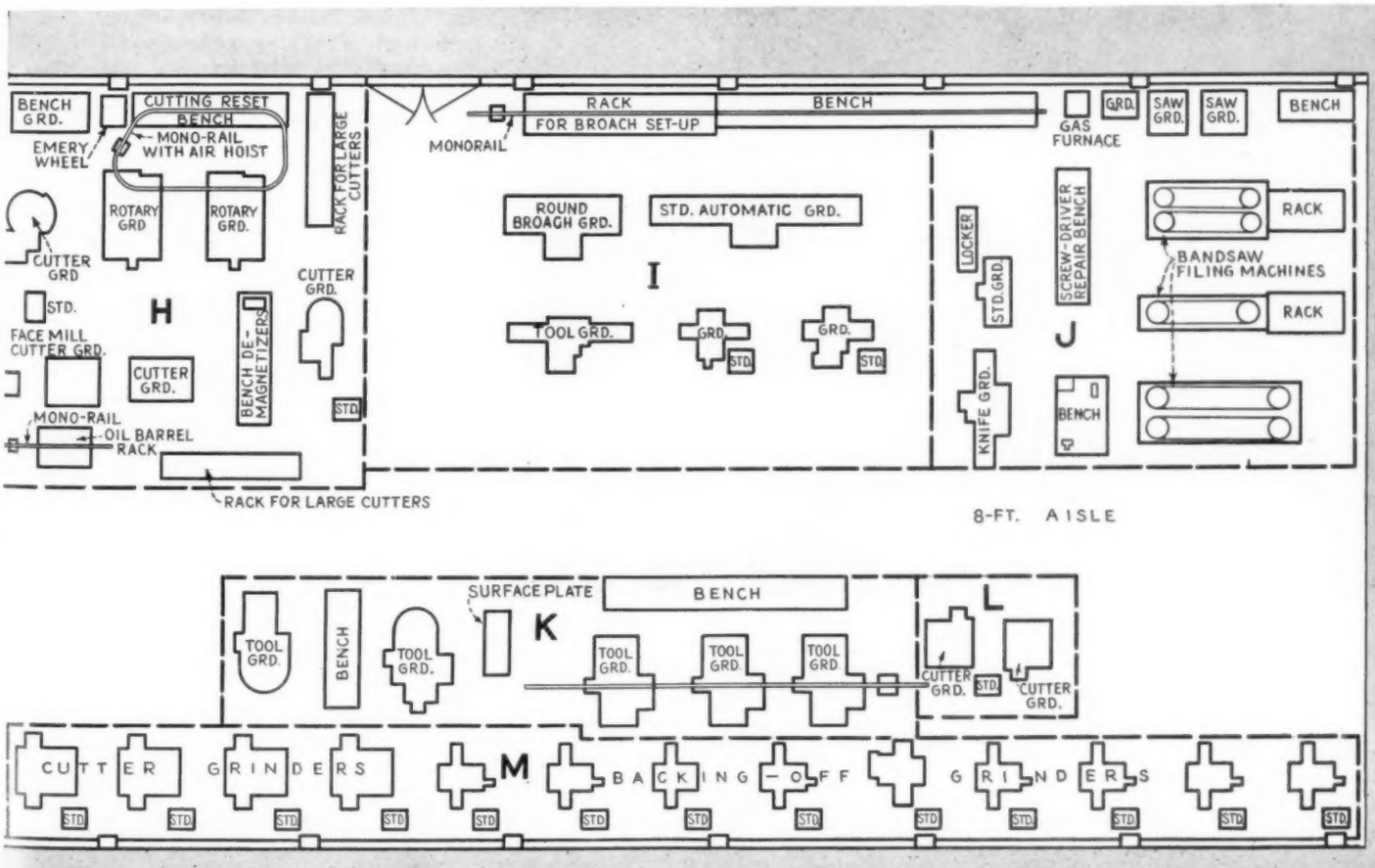
Each of the 48 grinders on which the work is ground dry has an exhaust hood with a 3-in. orifice. Air velocity through the orifice is 9,000 ft. per min., which is equivalent to a suction of 5 in. of water. Exhaust ducts are connected to a 38-in. main duct, which handles 38,000 cu.ft. of air per min.

A 200-ft. power duct running down the center of the department provides quick connections for machines and permits easy rearrangement. Flexible cable from the machine is looped from the ceiling and connected with the power duct through a fused plug.

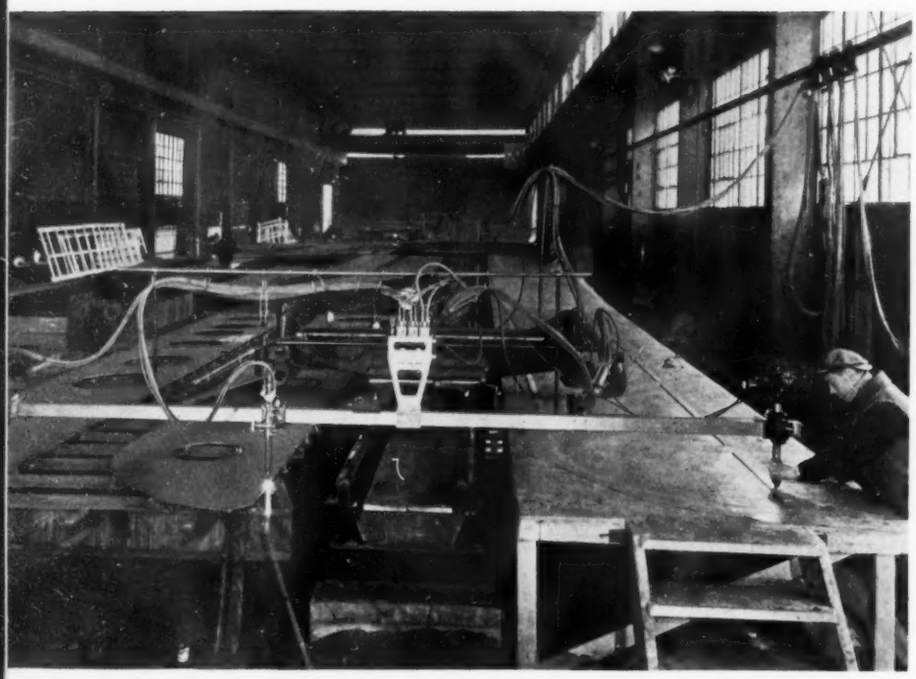


Forty broach blades for the cylinder-block top face, or 80 blades for the two pan-rail surfaces, can be set up at once for grinding the front clearance angle, using special spacer blocks. These blocks have opposite edges ground at the same angle as the tools to permit fast, accurate set-ups

Packard's tool and cutter grinder department is divided into thirteen major sections, identified by letters. Functions of each are kept separate



Flame-cut ship plates



This is one of two large flame-cutting units installed in eastern shipyards for shaping floor plates, intercostals and skin plates for Class C cargo vessels. Mass-production cutting is possible because a number of these vessels identical in size and design are under construction in the yards

Cutting of plates for identical Class C cargo vessels is done in two work areas served by one flame-cutting machine. While crane crews remove cut plates and set new ones in the first work area, the machine is shaping plates in the second area. Note the position of the hoses and cables supported by carrier trolley and sheet-metal saddles; kinking is avoided

For the first time in the shipbuilding industry, shop layout and material-handling facilities are designed for in-line production at two stations on large flame-cutting machines

THE FIRST MASS-PRODUCTION flame-cutting units in the shipbuilding industry were recently installed in the two eastern shipyards for shaping plates used in the fabrication of Class C cargo vessels. They are believed to be the largest installations of their kind made up to the present time. Shop layout and material-handling facilities were designed for in-line production around large shape-cutting machines, in place of the customary small portable machines.

Such line-production layout was practical only because of the large volume of work available when the owner of the two shipyards received an order for a number of Class C cargo vessels of identical size and design. Thus economies could be made in templet design, shaping and beveling of plate sections, cutting weight-reducing holes in plate sections, welding fixtures for sub-assemblies, and final assembly on fabrication.

The two installations of shape-cutting machines herein described are located in separate shipyards. One has a No. 20 Travograph with six lengths of track 96 ft. long, while the other has a similar machine with five lengths of track 80 ft. long.

In the general scheme of line production used in the plate-shaping department, the plates come in by crane at one end of the shop from storage racks. The crane crew places the plates in two work areas served by a single shape-cutting machine. These areas are on a work table 10 ft. wide by 100 ft. long; the tracer table is 6 ft. wide by 100 ft. long. After cutting one set of plates in the first work area, it is cleared by moving the machine to the second work area at the opposite end of the shop. The crane service crew then removes the cut plates for delivery to the fabrication shop, and replaces them with new stock for cutting.

The work table is made of steel horses, rails and angle iron which were available in the yard. The horses are set on concrete foundations. The tracer table is constructed with a board tongue-and-groove top, which is marked with parallel and transverse scored lines. These serve as register marks to place quickly the regulation paper templets, and to check templet dimensions; unless care and judgment are used, long paper templets lead to inaccuracy due to change of length from humidity and temperature.

Curves and shapes on the templets are followed by hand, using a manual tracer. Where straight runs occur, the manual tracer wheel runs on a $\frac{1}{4}$x$1\frac{1}{2}$-in. grooved wood batten. The batten is nailed to the top of the tracer table at the proper register mark, and serves to align and hold the templet to length.

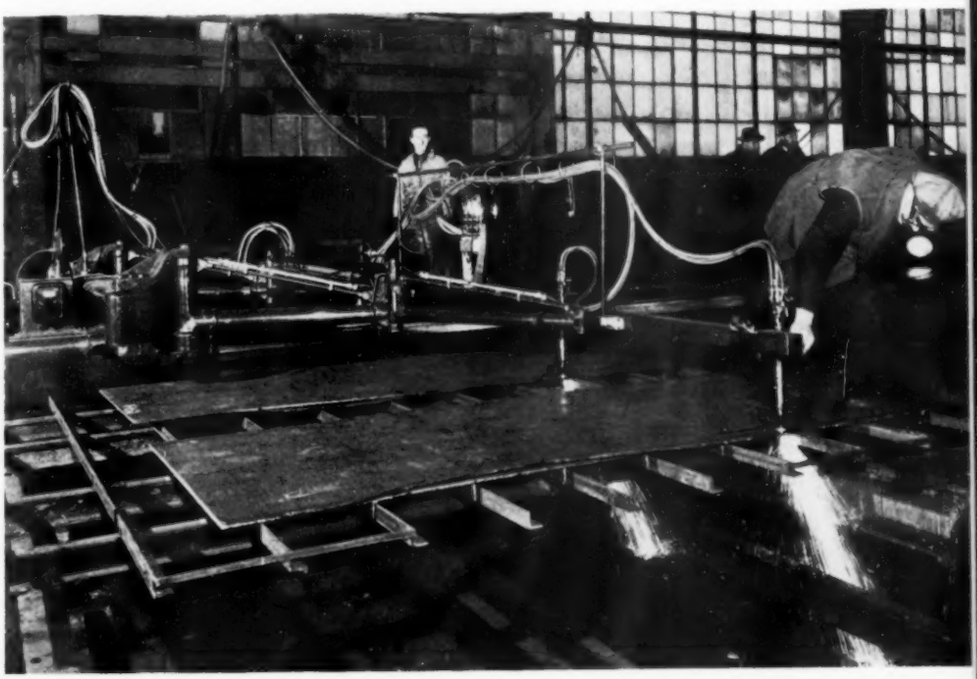
With the particular templets illustrated, it was possible to make ten layouts which served for cutting of twenty plates before a templet change was required; however, as the ship keel and bottom change in contour the multiple number of like sections will be reduced.

The templet and work pieces illustrated are floor plates. The latter are $\frac{5}{16}$ in. thick by approximately $3\frac{1}{2}$ ft. wide by 30 ft. long. The lightening holes and outside contours involve approximately 118 lineal ft. of cutting per plate.

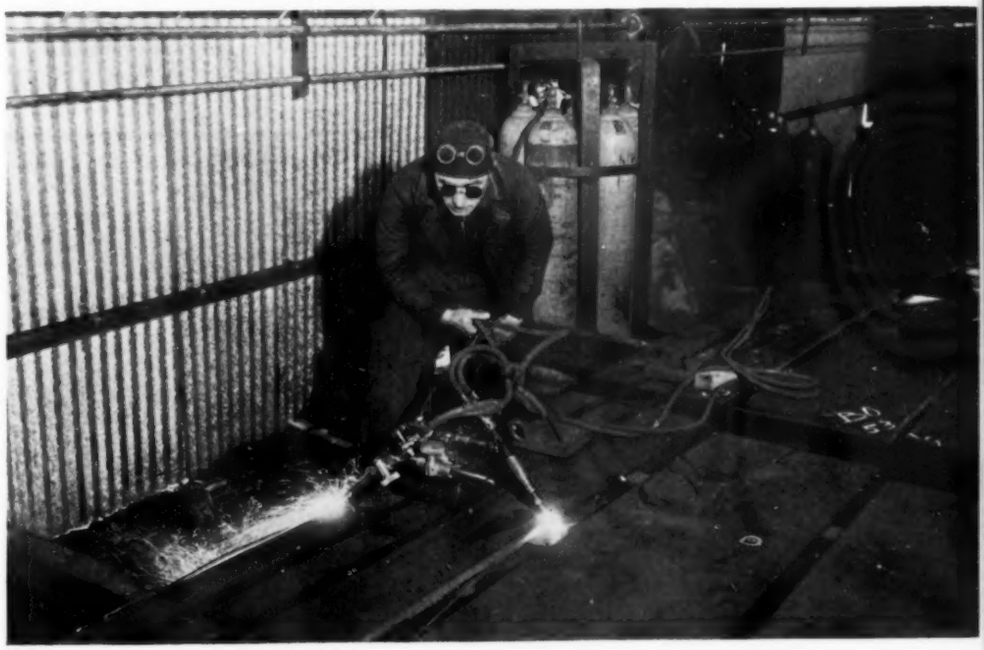
The tips in use require 35 lb. cutting oxygen, 10 lb. preheat oxygen and 6 lb. acetylene pressure. The cutting speed is 21 to 26 in. per min., depending upon plate condition. A set of two 30-ft. plates is cut in from 54 to 67 min. Move-up time and starting time on a new batch of plates require approximately 5 min. The length of floor plates of course varies with the ship contour from 8 to 30 ft. in length. Floor plates, intercostals, skin plates and many other shape plate sections are cut.

The hose support and conveyor developed on this job includes a carrier track and trolleys similar to those used to carry sliding factory doors. A saddle formed from light sheet metal carries the hoses and cable without kinking. The hose support is attached to the top of the carriage arm so as to get the hoses as near as possible to the suspension carrier track. The hose loops are approximately 20 ft. long and clear the ground when the cutting machine is in forward position with all carrier trolleys at the front end of the track.

Radiagraph machines are used in the shops for plate preparation requiring straight, bevel, circular or oval cuts. In fabricated and welded ship construction there are virtually miles of steel-plate beveling to be done, and where there are a number of vessels to be built flame-cutting and crane-handling facilities are likely to be overtaxed and become the bottle-neck of fabrication. Hence, low-cost portable machines are used wherever the plates can be placed.



The plates are cut on a work table formed by angle irons laid transversely on rails running over steel horses mounted on concrete foundations. The tracer table has a board top marked with parallel and transverse lines which serve to register and check correct dimensions of paper templets



Many portable flame-cutting machines are used throughout the shops where the identical Class C cargo vessels are being built. They are placed wherever the plates can be cut conveniently, thereby minimizing crane handling. Here is a Radiagraph cutting two 45-deg. bevels simultaneously on filler plates; it is but one of the many types used in shipyards

Equipment for bar work

BY J. R. LONGSTREET AND W. K. BAILEY, THE WARNER & SWASEY COMPANY

By using a permanent set-up of universal bar tools changes from one job to another become easy. Only collet bushings and cutters need be changed for most work

UNIVERSAL TOOLING EQUIPMENT kept in a "permanent set-up" on the turret lathe, reduces set-up time and makes possible economical production of parts in small lots. This method of tooling a turret lathe is of particular importance in the average shop, where changes in set-up necessarily are frequent. Parts varying as much as those shown in Fig. 40 can be made from bar stock in a universal turret lathe with a minimum of set-up time when universal tools are used.

Tools included in a standard "universal bar equipment" set-up, Fig. 1 (*AM*—Vol. 84, page 80) and Fig. 39, are each designed for a specific purpose. Each tool of the set covers a range of work equal to the capacity of the machine for which it is made. For example, for a 1½-in. machine the single cutter turner has capacity for diameters from ⅜ to 1½ in. The center drilling tool will center bars ranging from $\frac{3}{16}$ to 1½ in. diameter, and the adjustable knee tool can be used to turn short diameters up to 1½ in. The tools included in such a set permit the machining of almost any bar job.

In a "permanent set-up" for bar work the flanged tools are bolted to the turret in proper sequence for ordinary work, and shank-type tools easily are installed on the other turret faces to complete the set-up. With such a set-up already on the machine, changes from one job to another become easy. Simply change the collet bushings, mount the shank-type tools needed, grind and set the cutters, set the stops, and you are ready to start.

To hold set-up time at a minimum, the complete equipment must be available for quick selection and use. All tools not permanently mounted on the turret should be kept close to the machine. The operator should be furnished with a stand on which his tools and cutters can be kept in order so that they can be found quickly.

Layout for Typical Bar Job

Advantages of a permanent turret lathe set-up incorporating universal tooling equipment best can be illustrated by a description of the tooling layout for a typical job, such as the shaft shown in Fig. 38. This piece, made from SAE 3250 bar stock, is to be heat-treated and ground after machining. Only 20 pieces are required, so the set-up must be as economical as possible.

Selection of the proper machine is important. Here, the work is short, cuts are moderately heavy, and both combined and multiple cuts should be taken if possible. Several changes in speed should be made and, since size of bar and length of part are within its capacity a geared-head 2½-in. bar capacity ram-type universal turret lathe is a logical choice.

When the accuracy requirements of the job are studied, we find that the diameters do not have to be turned to very close limits since they have to be ground after hardening. However, it is necessary to keep the diameters closely concentric in order to allow for "clean-up" in the grinding operations. It also is necessary to have the threaded end, which is not ground, run reasonably true with the other diameters. Close concentricity of diameters best can be obtained by turning them at the same time.

A study of possible methods of doing this job will show that the best method for this piece, when made in

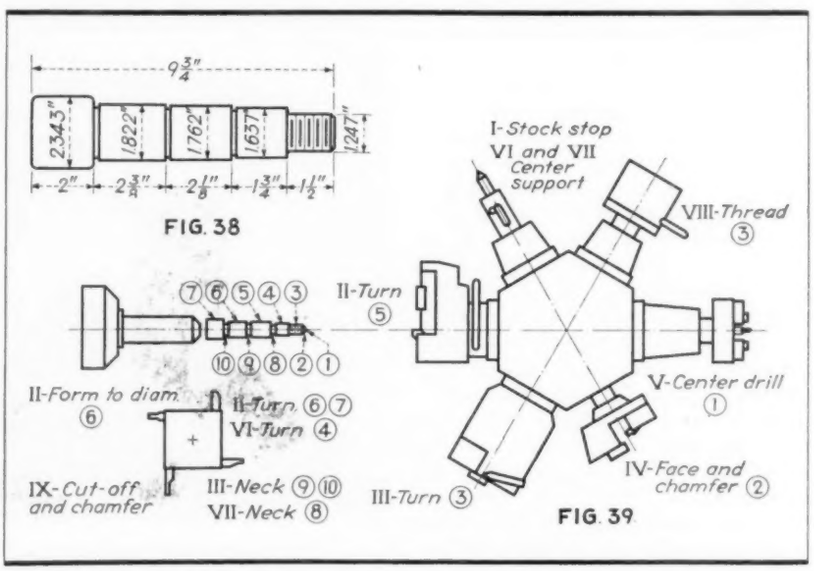


Fig. 38—This SAE 3250 shaft can be turned from bar stock with universal tools. Fig. 39—A tooling set-up such as this would be economical for the shaft shown in Fig. 38 when made 20 at a time

Fig. 40—Produced with universal bar equipment, these parts involved widely different operations which easily were performed with a minimum of set-up change

quantities of 20, will be to first turn diameter (5), starting at the end of the bar, using a single cutter turner on the hexagon turret. At the same time diameters (6) and (7) are turned from the square turret. It should also be possible to combine the turning of diameter (3) with the necking of diameters (9) and (10). On this basis the complete tooling layout is shown in Fig. 39. All tool stations are used for this layout. Order of the nine operations, *A* through *I*, is indicated in Fig. 41.

Selected Operations

These operations are: *A*—feed stock to stop in hexagon turret; *B*—turn diameter (5) with hexagon turret, form to diameter (6) and turn diameters (6) and (7) with square turret; *C*—turn diameter (3) with hexagon turret, neck diameters (9) and (10) with square turret; *D*—face and chamfer (2) with hexagon turret; *E*—center drill (1) with hexagon turret; *F*—turn diameter (4) with square turret; *G*—neck diameter (8) with square turret; *H*—thread diameter (3) with hexagon turret and break corners of diameter (7) with file; and *I*—cut off and chamfer with square turret.

One of the problems on short bar work of this kind is to so arrange the tooling that cutters on the hexagon turret and on the square turret can be used at the same time without interfering with each other. This can be solved by holding square-turret cutters in the right-hand instead of the left-hand corner of the turret, as in Fig. 42. Ordinarily, square-turret cutters are placed in the left-hand corner in order that they can be used close to the chuck. However, on short bar work it often is better to pass up this advantage for the more important possibility of combining cuts with those which can be made with the hexagon turret.

In order to work with cutters in the right-hand corner of the square turret, the bar must be drawn out of the chuck far enough for the square turret to clear the chuck body. This method of positioning square-turret cutters is not recommended when the bar diameter is too small to permit cuts from the square turret without bending. On a machine in good condition a 1-in. bar of cold drawn 0.10 carbon steel can be cut off with a $\frac{1}{8}$-in. wide tool at a distance of 6 in. from the collet.

How Many in a Lot?

The number of pieces to be made almost always will affect the set up. In the tooling layout shown in Figs. 40 and 41 the best layout for 20 pieces has been made. Now, what happens if this same layout is used for a smaller quantity, say of four pieces, or for a much larger quantity —say 120 pieces.

Set-up time for the layout shown in Fig. 40 is 60 min. Work-handling time for each piece is 0.5 min. and the machine-handling time for each piece is 1.0 min. Cutting time per

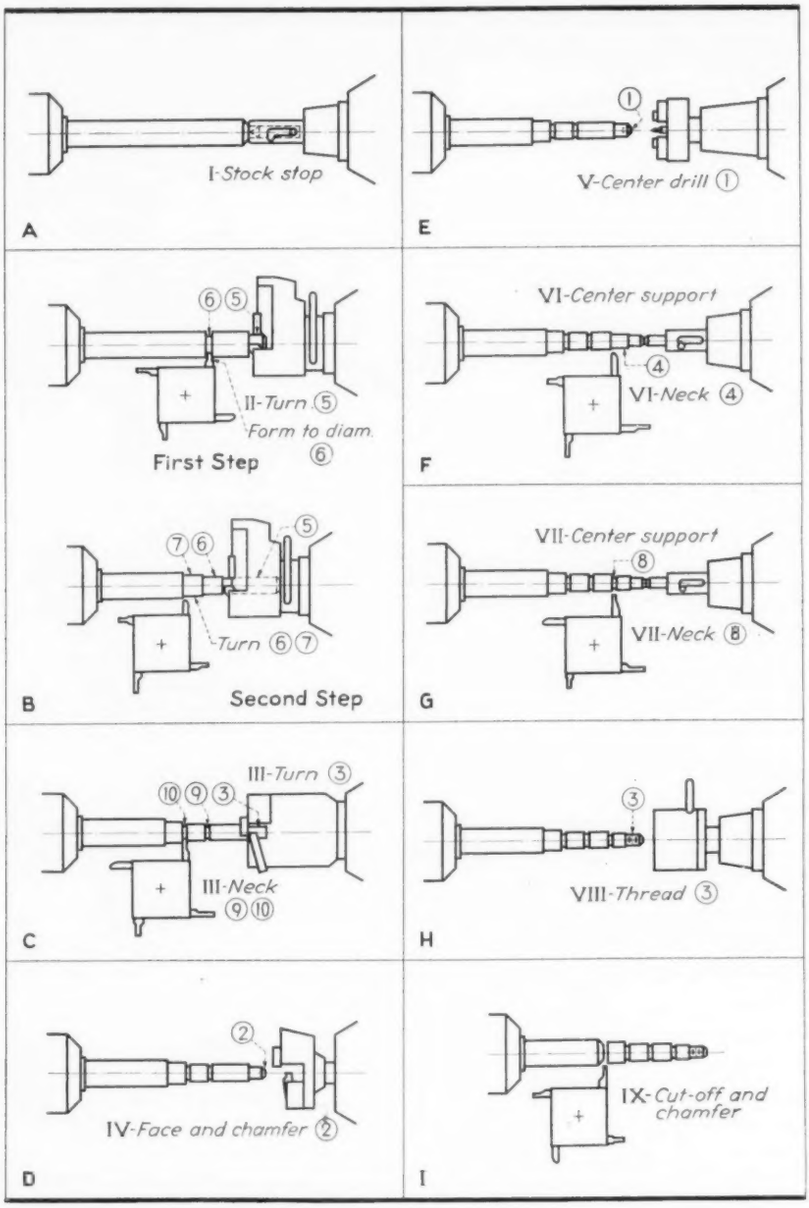


Fig. 41—Order of the nine operations for making the shaft shown in Fig. 39 is indicated. The operator brakes corners on ends of diameter (7) during operations H. *Hexacon and square turrets are used at the same time whenever possible*

piece is 8.0 min. Dividing total set-up time (60 min.) by the number of pieces in each lot gives 15 min. set-up time per piece in lots of four, 3 min. in lots of 20, and 0.5 min. in lots of 120. Total production time per piece (sum of set-up, work-handling, machine-handling, and cutting time per piece) then is 24.5 min. in lots of four, 12.5 min. in lots of 20, and 10 min. in lots of 120 pieces.

In the case of the four-piece lot, a set-up time per piece of 15 min. obviously is too great. Similarly, cutting time per piece is out of proportion when machining a 120-piece lot. Thus, the best set-up for a 20-piece run on this job is not the best for either a much smaller or a much larger lot. In the case of the four-piece lot, a change in set up would be necessary; tooling should be changed if 120 pieces are to be made.

When considering the set-up shown in Fig. 40 to see how it should be changed for a four-piece lot, we know that much of the set-up time could be saved if stops were not set and if the single- and multiple-cutter turners were not used. However, since so much time is saved in combining the turning of diameter (5) with diameters (6) and (7), it is obvious that the single-cutter turner should be used even when only four pieces are to be made. This is not true of the cutter set in the multiple turner for diameter (3); such a cut on small quantities could be taken to advantage from the square turret. A stop would be set for the single-cutter turner so that after this cut is started the operator will be entirely free to work the cross slide without giving further attention to the single-cutter turner. Scale measurements are used for all other cuts.

Reduced Set-Up Time

In comparing the time to produce a four-piece lot and a 20-piece lot, the set-up time on the smaller lot can be reduced 10 min. by not setting the stops, another 10 min. can be saved by not setting the cutter in the multiple-cutter turner and by turning diameter (3) from the square turret, as in Fig. 43. This saving of 20 min. in set-up time represents a reduction of 5 min. per piece. Work-handling time is the same as in the 20-piece layout, but the machine-handling time is increased 0.25 min. and cutting time is increased 0.50 min. This amounts to a net saving of 4.25 min. per piece, reducing total production time per piece from 24.5 to 20.25 min.

A study of the set-up shown in Fig. 40 indicates that a good deal of cutting time could be saved by turning diameters (3), (4) and (5) at the same time with a multiple-cutter turner, and that diameters (6) and (7) still could be combined with these cuts. Furthermore, the necking cuts (8), (9) and (10) could be taken at one time by placing three cutters in a standard necking tool block placed on the rear of the cross slide.

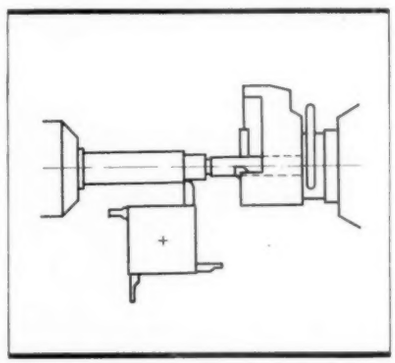


Fig. 42—Positioning cutters in right-hand cutters of square turret permits use of both turrets at same time without tool interference when working on short bar lengths

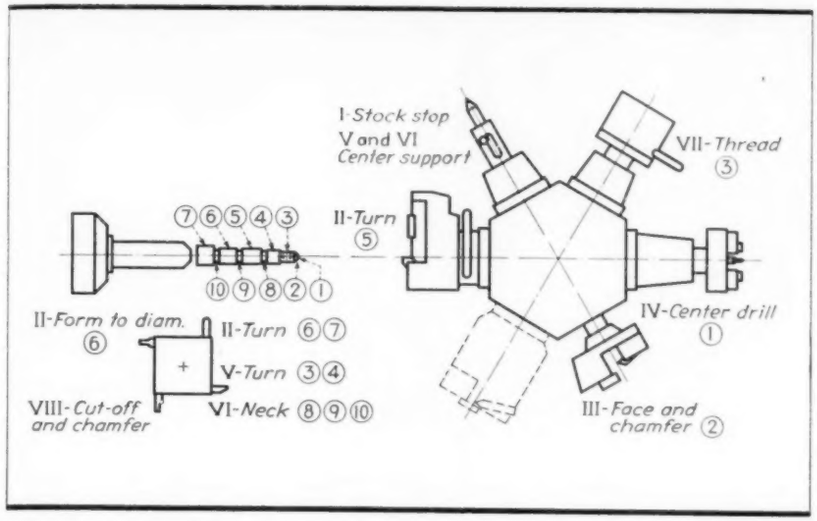


Fig. 43—Set-up time is decreased at the expense of machine-handling and cutting times with this layout, but total time per piece is reduced by 4.25 min. by so doing when only four pieces are to be machined

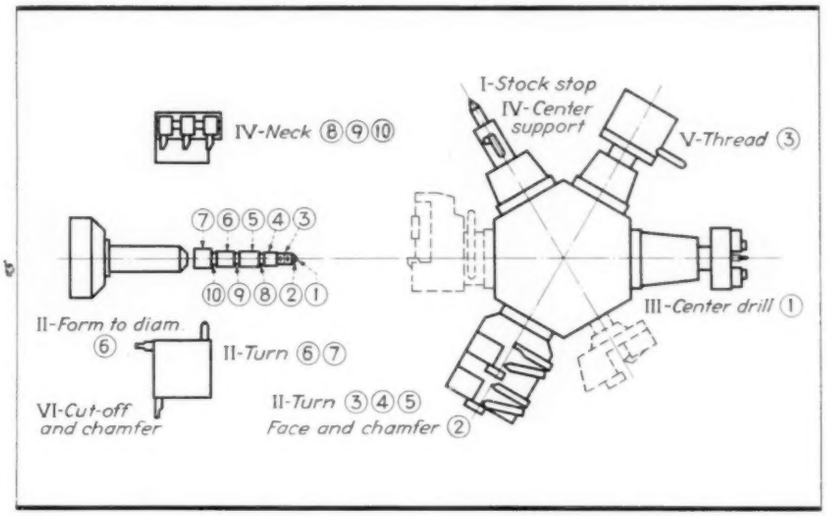


Fig. 44—Set-up time is doubled, but cutting time of 8 min. per piece for layout in Fig. 39 is reduced to 5.5 min. and machine-handling time is shaved 0.5 min. per piece. Net result is a saving of 5 hr. on an order for 120 pieces

Changes in the set-up in order to reduce cutting time for the 120-piece lot is shown in Fig. 44. Set-up time for this layout is increased to 120 min. (1 min. per piece instead of 0.5 min.), and work-handling time is the same per piece as for the 20-piece lot. Machine-handling time, however, is reduced 0.5 min. per piece and cutting time is reduced from 8.0 to 5.5 min. per piece. Thus, a net saving of 2.5 min. per piece reduces total production time to 7½ min. per piece. This does not appear large, but it means that five hours are saved in doing 120 pieces.

It should be noted that in all three layouts, Figs. 40, 43 and 44, only standard tools are used. In this way, each job can be done to required specifications in as reasonably short a time as possible without resorting to special tooling.

From a forthcoming book on turret lathe operation.

Automatic oxy-acetylene cutting machines have set a new record for length of operating track. Two No. 20 Airco Travographs have just been installed in the Staten Island and Sparrows Point Yards of a large shipbuilding corporation to be used in cutting ship side plates to the necessary arcs. Each has a track 100 ft. long as compared with a maximum track length of 33 ft. only a year ago.

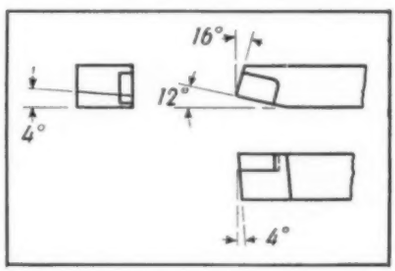
Carbide-Tipped Tools For Turning Brass

BY C. G. WILLIAMS

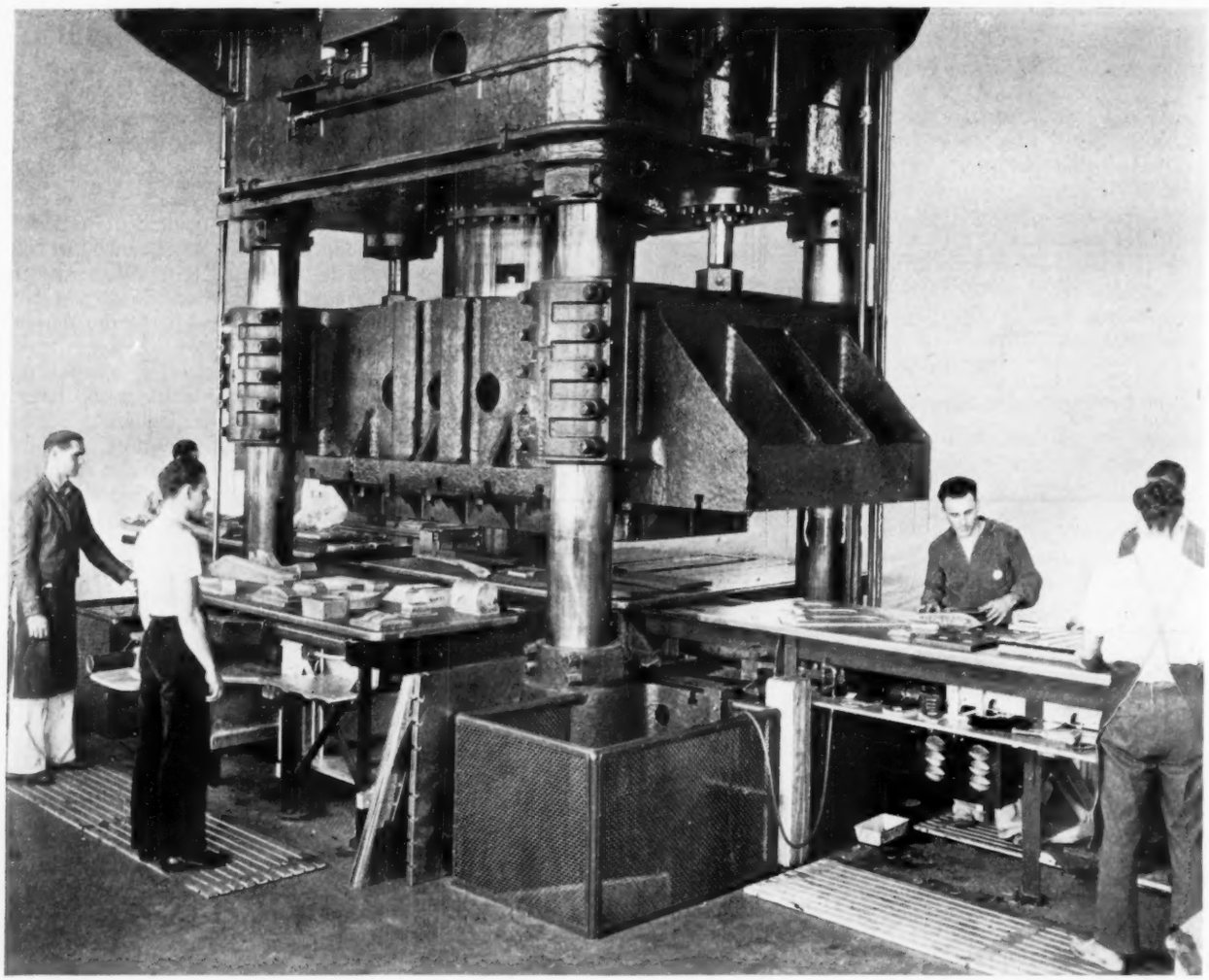
When designing carbide-tipped tools the characteristics of the carbides must be favored if rational production is to be obtained. In the article entitled "The Working of Wrought Coppers and Brasses" (*AM*—Vol. 82, page 1101), the design of the tool shown on page 1106 seems quite satisfactory, except that the radius at the point is too large. However, if I were designing a tool for brass or copper turning, I would not have the tip set parallel with the side of the tool, but rather as shown in the accompanying sketch, except where it is necessary to turn to a sharp corner or square shoulder then the design as given in the article would be used. Even then the heavy or continuous turning should be made with the tool shown in the sketch and the tool shown on page 1106 used only for truing up.

The carbides are a conglomeration of very hard carbide crystals held together by a binder, usually cobalt, and for that reason have more of the nature of a brick than that of a metal. Hence, the tool must not be made too thin at the cutting edge if good service is to be obtained. For this reason the tool shown on page 1108 might be satisfactory if made from high-speed steel, but has too sharp a cutting edge for use with a carbide tip.

In a plant classed as one of the largest in the United States, the tool engineer had designed such a tool as this for cutting aluminum. They acknowledged high breakage and said that the form had been derived from the one used on high-speed steel tools. They were quite surprised when shown that a tool designed as the one on page 1106, or as shown in the accompanying sketch, would give a smoother surface and could be run at double the speed with no breakage over a long period.



Carbide-tipped tools must not be made too thin at the cutting edge



The hydraulic press, well adapted for the Guerin process, is convenient for use with work-height loading tables

Aviation's "rubber stamp"

BY HENRY E. GUERIN, FACTORY SUPERINTENDENT, DOUGLAS AIRCRAFT COMPANY

II—How the Guerin process uses restrained rubber to blank and form sheet metal was told in a previous article. Some of its advantages are outlined

IT IS NOT the purpose of the Guerin method to supplant drop hammer methods. Generally speaking, the two processes have their own particular limits. While there are many jobs that can be done by either method, the scope of each is usually well defined. Often it is possible to pre-form by the Guerin process, finished by the drop-hammer, and so save the cost of a lead punch and the time required to complete the first stage of forming.

Forming by the Guerin method does not shrink metal to any appreciable extent, and if properly tooled, the operation will not stretch the metal materially during drawing operations. However, in forming simple flanges stretching does occur and is permitted within limits to simplify tooling. Likewise, in parts with simple flanges where a shrink is necessary the practice of scalloping is allowed within established limits. For those parts on which scalloping is not permitted, the part is formed and the wrinkles are controlled by notching the form blocks. The metal is forced into these notches during the forming operation and this accumulation of metal, called a "shrink pocket" leaves the flange clear for attachment in assembly. However, because of distortion in assembly, it is found better practice to remove these wrinkles

entirely by hand forming with a mallet much the same as in drop-hammer work. This hand work is only occasionally necessary. Should strength requirements dictate, or production quantities warrant a heavier investment in tooling, these same parts can be drawn and trimmed without scallops, shrink pockets or hand forming, by the Guerin method.

In all cases the work should be tooled to effect a draw in the metal. This requires that the edges of the work be stabilized in such a manner as to permit the metal to slip and flow into the desired shape as determined by the die. Always in forming material, where there is a bend on a straight line (straight break), this change in the shape of the metal is effected by stretching the outer portion between the bend allowances around the bend radius and shrinking the inner portion, between the bend line, over the bend radius. There is, then, a point within the cross section of the material between the bend lines where there is neither shrink nor stretch, a neutral axis around which the actual bend is made. In forming material in a flange that is not on a straight line, if the shape is convex the entire cross section of the material in the flange must be shrunk to effect the change in form. But if the shape is concave the entire cross section of the material in the flange must be stretched to achieve the new form.

In drop-hammer forming, where the use of a pressure pad is neither common nor economical, this stretch is obtained by the force of the punch, which has a tendency to enlarge or stretch the material to suit the shape of the punch. When there is much of a shrink, the metal usually wrinkles at the point of shrink and the operator is obliged to straighten the work by hand shrinking with a mallet.

In forming shapes that are dished, such as tank ends and pans, on the drop hammer, the punch has a tendency to flow the material slightly in changing the flat sheet to the desired shape, but most of this change is accomplished by stretching the material around the punch. Material can only be induced to flow properly to the desired shape when a suitable pressure pad is used to restrain the edges of the blank.

With the Guerin method we are able to draw this material into a dished shape without shrink or stretch by restraining the outer edge ot the material under exactly the same pressure that is applied to the section being draw formed. This is the pressure of the restrained rubber which is, of course, identical in every part of the container within which the work is performed. As this pressure increases, the material is forced into the shape of the die and the edge, being restrained by the pressure of the rubber, does not buckle but gradually slips or flows into the position determined by the die. Only when the restrained edge of the material has too much area exposed could sufficient friction be created to overcome the yield strength causing it to stretch, rather than flow. Generally speaking, forming done by stretching is undesirable in airplane structures and can only be applied to such unstressed parts as cowling and fairings. For most efficient structure, all materials should be drawn rather then stretched, effecting a weight saving in the forming of wing ribs, fuselage frames, fairings, cowling and skins.

It has been our experience that thin gages of stainless steel handle much better with the Guerin method than by any other except the most expensive methods employing conventional tooling. This is particularly true in cases where the forming does not change large portions of the part from the plane of the flat blank of the material. One-quarter hard stainless steel can be formed into some shapes. Aluminum, dural, mild steel, and soft stainless steel form with good success when proper consideration is given to the specific forming problem and to tooling.

The limits for cutting operations in soft aluminum have been up to and including 0.051 in. The limits for forming operations in soft aluminum alloys are up to and including $\frac{3}{16}$ in. in thickness, the heavier gages being limited to forming conditions where sufficient area is exposed to effect the bend. Combination cutting and forming of soft aluminum alloys is accomplished with excellent success up to and including 0.040 in. Progressive forming and cutting actually draws the aluminum alloy material into deep shapes or sections without thinning the material.

A recent addition to the scope of

Scribed parallel lines on a wing rib nose section (lower right) show the even flow of metal resulting from the use of a rubber pad in forming

the Guerin process has been the hot forming of magnesium alloys. Hot forming is accomplished by the use of heater plates, either attached to the pressing block or mounted on one of the loading tables. Temperature of this heater plate is controlled to a point permitting the form block itself to maintain the desired temperature required for satisfactory working of magnesium. This temperature varies with the nature of the work. It is desirable to form magnesium alloy parts at the lowest practicable temperature. Our experience has shown that these alloys form better at a minimum forming temperature than at the maximum allowable temperature permitted by the nature of the material. This also applies to cutting of magnesium parts by the Guerin process. When the temperature is allowed to rise to the upper limit, a rough edge results, although a smooth cut is posible at the lower temperature allowable. The short time that the pad is in contact with the material and the use of special composition, makes it practicable to use rubber with hot working.

We have found that the hydraulic press is most satisfactory for application of the Guerin method, although we have successfully accomplished samples of practically all types of work on punch presses, toggle presses and drop hammers. With the hydraulic press tremendous pressures can be built up gradually.

A standard hydraulic press with four strain rods is particularly well suited to loading table equipment, permitting the use of four loading tables between the strain rods. The first press used in the Douglass plant was a 300-ton press with a 30 x 30 in. bed and a moving platen. Our largest equipment at present is a 5000-ton press, with a pressing block measuring 50 x 168 in. This length of working surface gives some conception of the capacity of the press either for multiple layouts or for single parts of unusually large size.

The use of conventional tooling to fabricate such parts as are produced by the Guerin method would require a large outlay in toolroom equipment and the employment of many trained die-makers, plus long delays in preparation of tooling. When such parts are fabricated by conventional tooling methods involving pressure pads, double and triple action presses and die cushions, these tools must all be adapted to meet the various mechanical problems encountered in draw forming and blanking specific parts.

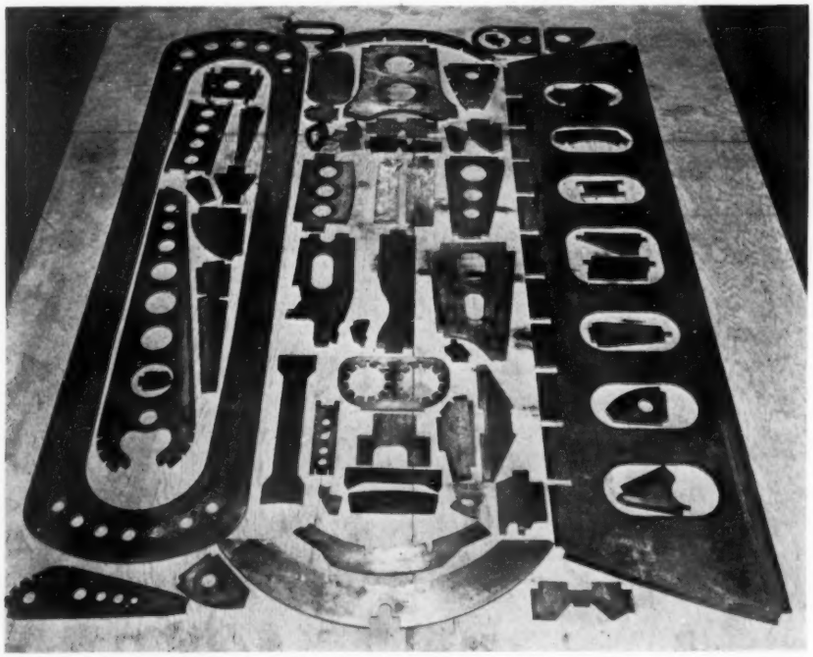
The simplicity of tooling under the Guerin method is outstanding in many ways. Form blocks are usually made from Masonite. The deep sections requiring more strength are made from cast materials such as zinc, Kirksite, Dowmetal and aluminum alloys. Patterns are first made of wood and with the use of simple foundry practice, actual forming dies are cast. Little hand work is required to clean up such dies.

For practical reasons cutting dies are standardized. A Masonite block $\frac{3}{8}$ in. thick is used in conjunction with a $\frac{1}{32}$ or $\frac{1}{16}$-in. chrome-molybdenum plate of proper shape to maintain the sharp edge at the point of cutting. These individual cutting blocks are then nested on the $\frac{3}{32}$-in. steel gang plate. Often in completing shapes that require both cutting and forming Kirksite is cast from a pattern, and the edge is sharpened with a vixen file or a cutting tool on a flexible shaft grinder, resulting in a satisfactory cutting edge for limited runs.

Where only flanging is required, a form block of simple design is cut out of Masonite thick enough to accomodate the formed flange. On more complicated sections, a shelf is cast integrally with the form die, which serves the purpose of a pressure pad on the die. The rubber in the container supplies the pressure, forcing the blank against the shelf on the die. Thus special pressure pads are not required and in all cases either the punch or the die is eliminated by the rubber itself. Dies may be either male or female, or a combination of both.

Although piercing holes is not a major feature of the Guerin method, many parts are blanked, pierced and formed among the more than 5000 different parts fabricated to date for the Douglas Aircraft Company. Piercing of rivet holes requires considerable expense in tooling and since it is considered better shop practice, in most cases, to drill rivet holes in aircraft material, hole punching has not been developed to an extensive degree. However, it is an essential part of the Guerin process, and may be developed further as circumstances require. Soft material in gages heavier than 0.051 in. and all heat-treated material cannot be blanked satisfactorily by the Guerin process.

For cutting or forming by the Guerin process, all parts are located on the cutting and forming blocks with simple bend pins which insure accuracy and uniformity, particularly in multiple-stage and progressive forming operations. Few parts require trimming after forming; although with some work hand finish operations are required. Because of the precision work done by the Guerin process all parts are uniform and assembly operations are expedited. Often the simple bend pinholes serve to facilitate parts location for assembly and avoid costly jigs.



Individual cutting blocks are often mounted on Masonite blocks $\frac{3}{8}$ in. thick and nested on a $\frac{3}{32}$-in. steel gang plate for efficient layout

Change gear calculations

BY JAMES W. DUFFY, ILLINOIS GEAR & MACHINE COMPANY*

A split feed formula and tables simplify the selection of feed change gears for non-differential hobbing of helical gears

THE MAN ENGAGED in cutting gears frequently spends much time in working out change gear combinations. Where calculating machines are available the problem is not difficult. Short cuts, however, are of interest where gearing is calculated by longhand methods.

Determination of change gears for hobbing spur gears requires no calculations by the machine operator. They are selected directly from available charts. Index or feed gears may be changed independently, and without regard to the pitch being cut.

Differential Method

When hobbing helical gears, the use of a differential mechanism permits selecting the index and feed gears from charts, as for spur gears. However, an additional set of change gears for the lead must be used. These lead change gears are calculated to produce a slight difference between relative blank and hob rotation according to the helix angle desired. These calculations involve changing the lead formula to a long decimal which, in turn, must be converted to fractions suitable for four convenient change gears.

The accuracy of the lead of the gear blank depends directly upon the care exercised in converting the decimal to fractions. The resulting lead error will be negligible if the calculations have been carried out properly. When mating gears are to be cut with the same lead gears a reasonable error in helix angle is acceptable; the calculations therefore may be approximate. Under these conditions the gears will still mesh properly because the lead, although possibly different from the theoretical lead, is identical on pinion and gear.

Neither a differential mechanism nor lead gears are required for the non-differential method of hobbing helical gears. The slight change between the relative blank and hob rotation needed to produce the required helix angle is accomplished by definitely correlating the index and feed change gears. This may be done in several different ways, but in all cases the accuracy of the lead depends upon the conversion of a long decimal to fractions suitable for change gears.

There are two basic ways of calculating the change gears for this method. In the most direct and simplest method the feed gears are exact and the index gears are calculated from a long decimal. The feed gears, being the same as used for spur gear cutting, may be selected from the chart. Index gears are calculated by multiplying the regular spur gear formula by the expression:

$$\frac{\frac{Lead}{Feed}}{\frac{Lead}{Feed} - 1}$$

Unfortunately, this method is suitable only for helix angles of 45 deg. or more, because whatever error exists in the calculations affects the indexing. For low helix angles a given error in calculation will result in much more error in lead than would occur when the method to be discussed presently is used. The above direct method seldom is used in any shop requiring high standards of accuracy, unless it has standardized on a 45-deg. helix angle.

FEED GEARING FOR 30 DEG. HELIX ANGLE

Normal Diametral Pitch (P^{ND})	*Constant (K)*	*Driver Gear*	*Compound Gears*	*Driven Gear*
1	50.2656	72	53	
			37	C
2	25.1328	36	53	
			37	C
3	16.7552	24	53	
			37	C
4	12.5664	18	53	
			37	C
5	10.0531	35	94	
			27	C
6	8.37760	12	53	
			37	C
7	7.18080	25	94	
			27	C
8	6.28320	9	53	
			37	C
9	5.58506	8	53	
			37	C
10	5.02656	13	75	
			29	C
12	4.18880	6	53	
			37	C

The other basic method for calculating change gears by the non-differential method involves the introduction of a feed constant into both the index and feed formulas to permit calculating the index gearing to an exact value. This transfers the calculation of the long decimal to the feed formula, where a given error in calculation will have less effect on the lead error of a gear having a helix angle of less than 45 deg. The fundamental advantage of this method for low helix angles has resulted in widespread use of the feed constant principle.

Various formulas are available in which the same constant is used for both index and feed calculations, but the one developed by Gould & Eberhardt some 30 years ago is used almost exclusively today by those companies using the non-differential method. This system best can be illustrated by typical formulas as follows:

Index change gears =

$$\frac{30C}{NC - 1} = \frac{Drivers}{Driven}$$

Feed change gears =

$$\frac{8\ P^{NC}}{C \sin\alpha} = \frac{Drivers}{Driven}$$

Where:

C = feed constant = $P^{NC} \div (F \sin\alpha)$.
P^{NC} = normal circular pitch of gear.
F = feed in inches per revolution of gear blank.
α = helix angle of gear with respect to its axis.
30 = a machine constant depending upon the fixed gearing ratio between hob and work spindles. This varies with make and type of hobbing machine.
8 = a machine constant depending upon the fixed feed gearing ratio and the pitch of the feed screw. This varies with make and type of hobbing machine.
N = number of teeth to be cut.

In applying these formulas, the value of C is either roughly calculated and rounded out to the nearest whole number, or selected from avail-

* Written in collaboration with J. E. Hequembourg and Granger Davenport, Gould & Eberhardt.

able tables covering a wide range of feeds, pitches and angles. The value of C then is substituted in the index formula which is expanded into two suitable fractions representing four convenient index change gears. When the fractions contain unsuitable values it is necessary to select a new value for C and recalculate. A slight change in the value of C merely results in a correspondingly small variation in feed, which is not objectionable.

The exact value for C found suitable for the index gearing must also be used in the feed formula, and the result reduced to a decimal and carried out to at least six places. A fractional equivalent of the decimal, accurate to at least five places, then is calculated and expanded into two fractions representing four feed change gears. Any change in setup resulting from a change of feed, pitch, angle or number of teeth usually requires complete recalculation of both the index and feed gearing.

Feed Formula Split

Since the greater portion of the time and effort required to calculate change gears for hobbing helical gears non-differentially is consumed in equating the feed gearing decimal to suitable fractions, it is evident that any means of facilitating or eliminating the calculations would be welcome. The following method has been given a thorough trial and may be used to advantage in plants standardizing on a limited number of helix angles.

In the application of this new method the feed formula mentioned above is split into two parts, one part being the regular C constant and the other a constant K. Derivation of K, when P^{ND} is equal to normal diametral pitch, is as follows:

$$P^{NC} = \pi \div P^{ND}$$

Then, from the typical feed formula previously given, feed change gears =

$$\frac{8\ P^{NC}}{C\ \sin\alpha} = \frac{8}{C\ \sin\alpha} \times \frac{\pi}{P^{ND}} =$$

$$\frac{1}{C} \times \frac{8\pi}{P^{ND}\ \sin\alpha} = \frac{1}{C} \times \frac{8\ \pi\ \csc\alpha}{P^{ND}} =$$

$$\frac{K}{C} = \frac{Drivers}{Driven}, \text{ where } K = \frac{8\ \pi\ \csc\alpha}{P^{ND}}$$

The first step in the selection of change gears using this method is to solve for K according to the helix angle and pitch. These calculations are carried out to at least six places, converted to a fractional equivalent correct to five places, and factored to *two* suitable change gear values in the numerator and *one* in the denominator. The remaining change gear for the denominator will be represented by C. Once these calculations have been made they may be tabulated for future use, as in the accompanying table of feed gearing for a 30 deg. helix angle.

To use the table, a feed is decided upon and the corresponding value of C calculated or selected from tables, as in the conventional method, then used with the gears tabulated. If the value of C is too small or too large for a convenient change gear, it is multiplied or divided as required and a numerator of the fractions likewise multiplied or divided.

For instance, suppose it is desired to cut a 30-deg. helix angle 8 P^{ND} gear using a feed of approximately 0.040 in. First determine the value of C, which equals 20 in this case, or select it from available tables. Index gears then are determined in the conventional manner, using $C = 20$. If this value of C is found suitable for the index gearing, the feed gears can be selected.

From the table, feed gearing for this example is:

$$\frac{9}{53} \times \frac{37}{C}$$

Substituting for C, we have:

$$\frac{9}{53} \times \frac{37}{20} = \frac{9 \times 4}{53} \times \frac{37}{20 \times 4} =$$

$$\frac{36}{53} \times \frac{37}{80} = \frac{Drivers}{Driven}$$

If it is desired to increase or decrease the feed after cutting several blanks, a new value for C is determined and only minor calculations are required to modify the feed and index gearing. As long as the new gearing is selected from the basic tabulated values, the same accuracy of lead will be maintained. Being able to change the feed without completely recalculating the feed gearing is an important advantage.

Another advantage of this method is the ease with which the tabulated values may be transformed for use on another hobbing machine employing a different ratio in the feed gear train. For instance, if a 30-deg. helix angle 8 P^{ND} gear has been cut on a Gould & Eberhardt hobber having a feed constant of 8, and the mating pinion is to be cut on a Barber-Colman machine having a feed constant of 1/0.075, the tabulated values in the example may be multipled by 5/3. The use of the same tabulated values for both pinion and gear assures the same accuracy in gearing calculations for both. Any error in lead resulting from the transformation of the long decimal to fractions will be common to both pinion and gear and will, therefore, be harmless.

In some plants the diametral pitch is preferred to normal diametral pitch. In such cases:

$$K = 8\ \frac{\pi\ \frac{\cos\alpha}{\sin\alpha}}{P^{D}},$$

where P^{D} is the diametral pitch, assuming 8 as the machine constant. In this formula it is important *not* to substitute *cot* α for *cos* $\alpha \div$ *sin* α unless seven or eight place cotangent tables are available.

Safety Is What You Make It

By ED WEST

We have been talking to some of the safety engineers we know around the country and it seems to us that you can put guards on belts, guards on machinery, goggles on every man in the shop, big signs on the bulletin board and people still insist on hurting themselves.

Just the other day we were walking through a shop while a man was setting up a machine. The machine was nicely equipped with all sorts of protective gadgets as was the entire shop. The operator got the idea that the edge of a tote box was a swell place to lay heavy tools while he was doing something else on the machine. Unfortunately, a tool rolled off onto his foot.

The safety engineer shrugged his shoulders and said that that was not an uncommon accident. Sure enough, watching for it in other shops we find that almost every man will lay tools on the edges of the most convenient table, bench, tote box or whatnot. Being cylindrical they roll off about 50 per cent of the time. Whether the man's toe is injured or the tool is damaged, it costs money, but we still haven't found a way to lick the problem.

"—and influence people"

BY JOSEF N. PETERSON

A little applied Dale Carnegie can work wonders in the shop. Skeptical? Hear what these toolmakers think of their boss

"AM I GLAD to hear that whistle! Sandwiches and coffee will taste mighty good after the morning I've put in!"

"What's the matter, John? Working for a change?"

"And how! It's this new foreman, Fred. I hate to call anyone a slave-driver after just a month, but—well, what do *you* think of him?"

"Oh, I don't know. Of course, he's stepped up the pace of this old toolroom to beat the band. But I wouldn't exactly call him a slave-driver. Seems more like he just has a knack of making folks hustle and like it. It's years since I went at it the way I've done lately. And I'm feeling better'n ever!"

"Another month and you'll be up to your old tricks again. Sneaking out to the washroom for a smoke every so often, reading the newspaper out of your bench drawer every morning—old dogs don't learn new tricks that easy. And you're no different than the rest of us."

"Who said I was any different? But speaking of old dogs, have you noticed Karl Brent lately? He's actually been whistling at his work, and you know that means he's busy. I've never seen him work as hard as he's done this last week. I've got an idea how this foreman got him started, too. Believe me, John, there's no moss growing inside that man's skull. He's clever."

"Why? What did he do?"

"The other day he came sauntering over to Brent's bench and started a conversation, very pleasant and cheery-like. Asked him all about himself and his folks, just like he was interested in knowing all about him—maybe he was, for all I know. Then suddenly he picked up that little forming die Brent's been playing around with for the last couple of weeks, and said, kind of surprised-like, 'Why Karl Brent! This is the slickest piece of die work I've seen in a long time! Only one man I remember could turn out nice, clean-cut work like this. That was Maxie Schultz, down at the main plant. Know him, Karl? He sure was the ace of all those tool and die makers we had down there. And fast, too. Why, it wasn't a thing for him to finish one of those battery-clip dies in a week, sometimes less, and he didn't do it at the expense of quality, either.' You should have seen him when he said it, John. His eyes trailed off out through the win-

dow, kind of rapt-like, as if he had a world of admiration for this Maxie Schultz's skill. Then after a few more casual remarks, he strolled off."

"What's so clever about that?"

"Why, old Brent's been falling all over himself, trying to outdo this Maxie Schultz! He's out to show this foreman *he's* the ace in *this* toolroom, even if he gets lumbago trying. He's the smartest die maker here, far as skill's concerned, but he's the laziest one, too. But no more!"

"Maybe so. Guess we all take pride in doing our work well, when we know it's appreciated. Is that what the boss has been doing to you, too, Fred? A little soft-soaping?"

"No-o-o. Can't say he has. He hasn't asked me any family questions yet, or been around patting my back, so far as I've noticed. Came around to my bench once, right after he started, and criticized my work some, but not in a way to make me sore."

"What did he say?"

"Oh, just that the company was trying to cut the price of those short-wave receivers, and that it would have to cut production costs all along the line, and that, naturally, included the cost of the tools I was making. Then he asked how I was making them, and after I'd told him, he said something like, 'Tell you what I think you ought to do, Fred. Take an hour or two, or maybe half a day, and give this job a good think. We make so many of these kind of tools it's worth the trouble. See if you can't discover some short cuts to save some time or labor. If you can think of a way to improve the design, don't be afraid to tell me about it. So long as I'm running this toolroom, credit's going to be given where credit's due.'"

"I'll bet he picked your ideas full of holes next day."

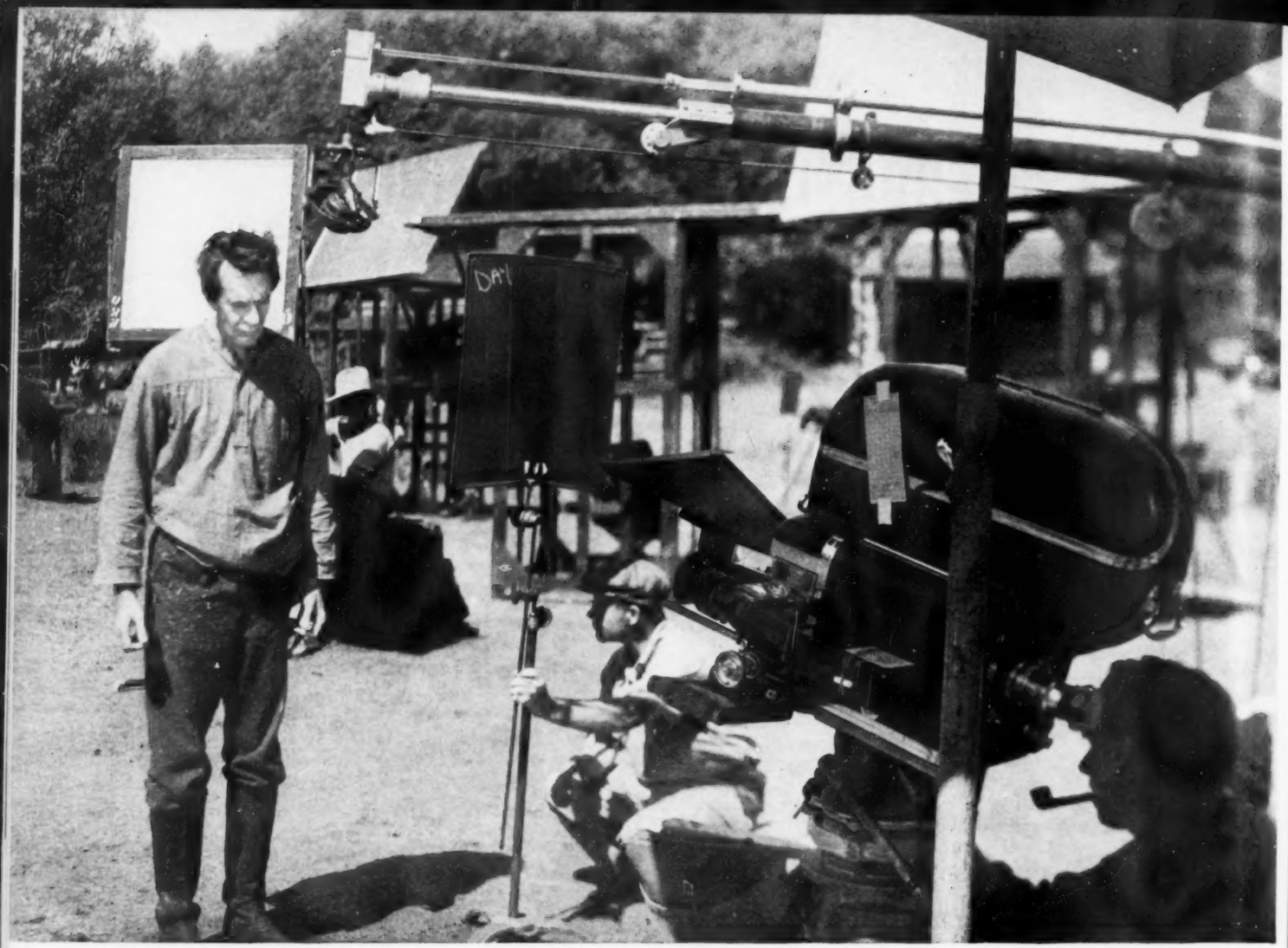
"That's just what he didn't do. After we talked it over he thought my changes were pretty good. 'You go ahead and make those tools according to your ideas,' is about what he said, 'and we'll cut the cost in half, at least.' Believe me, John, after that I couldn't let him down! And by using those short cuts, I really did cut the time in half."

"Well—"

"How about yourself? The other day when I passed your bench you were working like all get-out on that forging die!"

"Well, you know how it is, Fred. Guess the spirit's contagious. Besides, he came around to me the other day, too. Told me I was a pretty darn good die sinker. 'Not many of your kind around, John,' he said. 'Mighty glad you're working for me.' Then he chatted for a few minutes, and when he left he said, 'I've promised that die for the fifteenth, John. I'm counting on you!' Why, that was the first praise I ever had for my work in this joint! I'd feel like a heel to disappoint a guy like him. It's not going to be easy to give him that die by the fifteenth, but he's going to get it!"

"I know just how you feel. Like it was a privilege to work for him. Wonder how he does it? He must have plenty of personality, or maybe he just knows how to handle folks."



When Abraham Lincoln is through for the day and Raymond Massey goes home the machine shop's ten skilled men tear the cameras down and check, test and repair them for the next day's work

Service for the set

BY MARVIN M. BLACK

Beneath Hollywood's spurious glamour exists plenty of plain and fancy hard work. A well equipped, modern machine shop maintains equipment and builds special devices at RKO

"ROLL 'EM," cries the director and roll they do. Swiftly, smoothly, silently the cameras record every detail, every motion, every expression of the glamorous stars sweating before the lenses. Thirty seconds later the yesmen echo the staccato "Cut!" and the day's shooting is over. Or so the movie magazines would have you believe.

Leading ladies may become temperamental, extras miss their cues, script writers change their minds. But no matter how much film finds its way to the cutting room floor, the cameras must turn in a star performance every time. Keeping them in condition to do so is more than a mere routine job. It calls for a considerable amount of ingenuity and precision metal-working, which, in the case of RKO Studios, is made possible by a completely outfitted precision machine shop. In this shop is installed the highest type of standard equipment, including several engine and bench lathes, milling machines, drill presses and surface grinders.

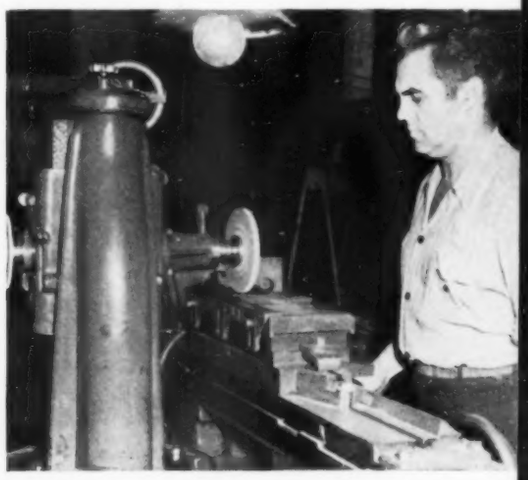
Early each morning skilled technicians prepare cameras for service on the set. After the day's shooting, every camera is inspected under actual running conditions. Every working part is then inspected in detail. The movement is taken out and checked for alignment, and sizes of all vital parts are inspected for wear or warpage. The mechanism is then reassembled in the camera and checked for pressure and focal distance. Every lens is cleaned, checked for loose

elements, reassembled, and again checked for focus under working conditions. Each view-finder is checked for focus, head-room, center line and parallax. An electrician inspects all wiring and the motor, and gives the complete mechanism a thorough sound test.

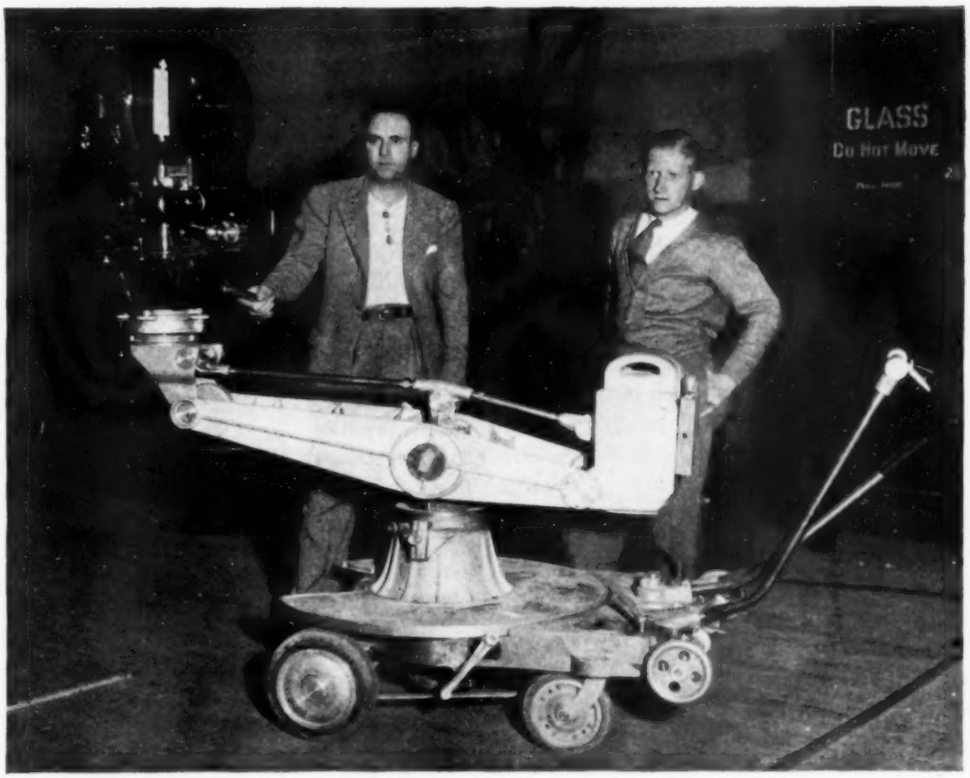
In addition to the routine maintenance and repair of equipment, each studio is constantly developing new devices to improve the work of the motion picture camera. In RKO's machine shop, as in similar shops at other major studios, manufacture of many types of accessory equipment is constantly under way. Among the custom devices built in the shop are lens mounts, special interlocked motors for process projection, and many widely varying types of equipment for special effects. A "blimp" to deaden the sound of the camera made in the RKO shop is said to be the only one of its kind having its entire frame fabricated of steel instead of aluminum.

One of the most impressive pieces of equipment built in the machine shop is the special camera dolly designed to satisfy the requirements of RKO's particular camera technique. This dolly can be used not only for moving the camera about easily, but also for achieving various moving-camera effects. With it the cameraman can quickly point his machine in whatever direction he desires, raise it, lower it, swing it and wheel it about. Constructed principally of aluminum, it is equipped with ball bearings throughout.

The surface grinder is useful in achieving the finish and precision required of many parts



Accessory fixtures must be rock-steady, so even standard - shape surfaces are milled for accuracy



Making specially designed gadgets requires machinists of wide experience. This dolly made at the RKO shops permits the camera to be moved, swung, and raised or lowered at once. Built almost entirely of aluminum, it is ball-bearing equipped throughout

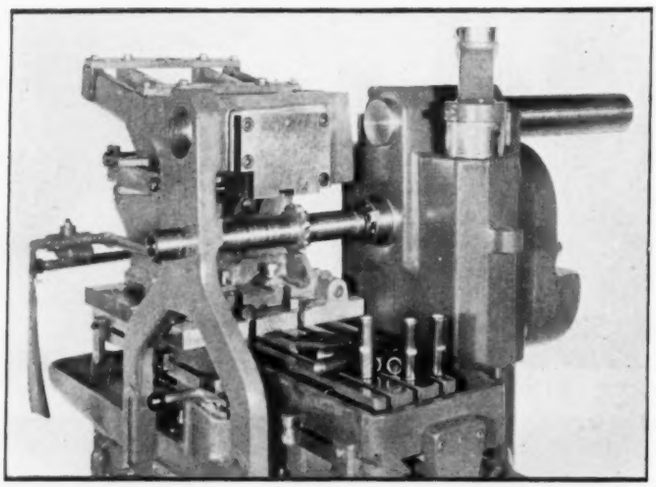
IDEAS FROM PRACTICAL MEN

Automatic Fixture for Milling Piston Pins

By WILLIAM H. HAWLEY

Illustrated is an air-operated automatic fixture for milling notches and similar operations in piston pins, king-pin bolts, motor shafts, shifter rods and like parts. This fixture was designed and built for either the Kent-Owens No. 1-14 milling machine or the No. 1-8 machine equipped with double-end automatic table reverse.

The operation of the fixture and the machine is



This air-operated fixture is used for milling slots in pine, bolts and shafts at a maximum production rate of 1100 pieces per hour. The hopper feeds parts to the fixture. Clamping, milling and ejection of the parts are continuous and automatic

entirely automatic. It is only necessary for the operator to keep the hopper filled with blank parts, these parts being automatically ejected when completed. The parts illustrated are milled at a rate of 1,106 pieces per hour.

The hopper and clamping mechanism can be readily adjusted to accommodate parts ranging in diameter from $\frac{3}{8}$ to $1\frac{1}{2}$ in. and in length up to $8\frac{1}{2}$ in. Other sizes can be handled by making modifications in the fixture.

With the hopper loaded with parts and the machine in operation, the cycle is as follows: (1) The table advances at a rapid traverse rate to the cutter during which time the air-operated clamp securely clamps the piece; (2) the rapid-traverse rate then changes to the proper feed rate and the cutter mills through the piece; (3) the table reverses and returns to its starting position at a rapid-traverse rate during which time the finished piece is ejected and a new blank is dropped into position for the next cycle. The work then advances to the cutter again and the foregoing cycle is repeated continuously and automatically.

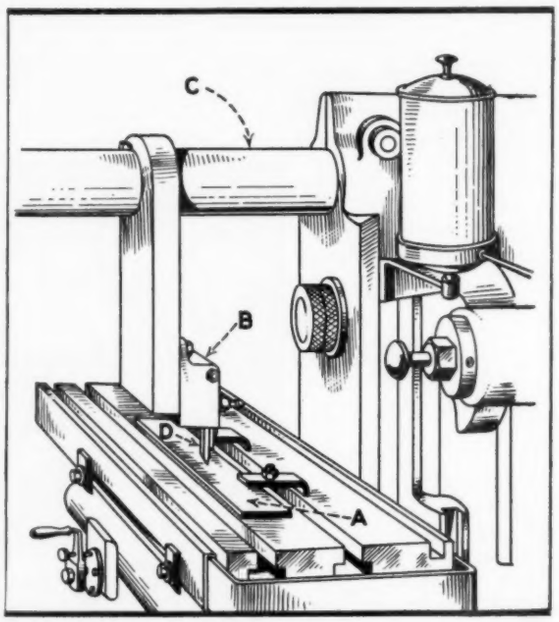
The hopper is provided with rails which can be properly positioned to accommodate parts of different lengths. Further, three sets of vee clamping blocks are necessary to handle the range of diameters from $\frac{3}{8}$ to $1\frac{1}{2}$ in. These blocks are easily and quickly changed. Vee clamping blocks of special shape can be furnished to suit various parts and operations.

A particular feature is that the cutter passes underneath the work so that chips fall into the clear and cannot get into the clamping or other mechanism.

Lineal Graduating in the Milling Machine

By M. B. SEYFFERT, TOOLMAKER
Newport News Shipbuilding and Drydock Company

In a small shop it is sometimes necessary to graduate special scales, using the equipment at hand. The



Special scales can be graduated in the universal milling machine to predetermined units or fractions thereof by following the methods outlined

work can be accurately done in a universal milling machine in the following manner:

Referring to the sketch, the scale blank *A* is clamped on the table parallel with its travel and a small clapper box *B* is secured to the cutter arbor *C*, the machine spindle being blocked so that it cannot revolve. The

tool *D* is held in the toolpost, its sharp point having been slightly rounded with an oil stone. The spindle of the dividing head is geared to the table feed screw in equal ratio, so that one revolution of the index crank will turn both the spindle of the dividing head and the feed screw 1/40 of a revolution. With a feed screw having a lead of 0.25 in., one revolution of the index crank will advance the table 1/40 × 0.25 in. = 0.00625 in. Consequently, 40 turns of the index crank will advance the table 0.25 in., 20 turns will advance it 0.125 in., and so on. From that as a basis, the turns of the index crank for any required graduation can readily be calculated.

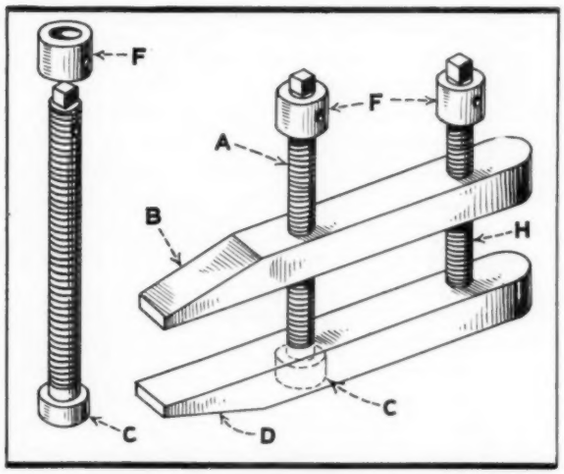
The lines of graduation are cut by moving the table toward the column of the machine by the cross-feed screw and are varied in length by end gages used as stops. As each line is completed, the back of the tool is lightly tapped with a hammer, driving it out of the end of the line in an arc, the radius of which is equal to the distance between the point of the tool and the pivot pin of the clapper.

Non-Interfering Screws for Parallel Clamps

By CHARLES H. WILLEY
Superintendent of Manufacturing
Hoyt Electrical Instrument Works

In some cases the parallel clamp with its conventional arrangement of screws can not be used because one of the screws, both of which project from the jaws in opposite directions, will interfere with the table of a machine or with some part of the work. To obviate that condition, changes can be made as shown.

The hole for screw *A* in jaw *B* instead of being a clearance hole is tapped and a new screw is made, its head being a free fit in the counterbore *C* in jaw *D*. Screw *A* passes freely through the clearance hole in jaw *D* and is screwed into the tapped hole in jaw *B*, and the collar *F* is pinned to it. Screw *H* remains in its original position in relation to the jaws. Thus both screws project from thte same jaw.

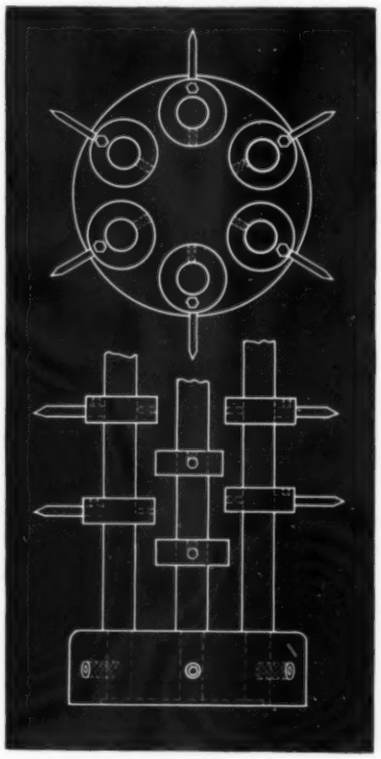


Both screws of this parallel clamp project from the same jaw and can be operated without interference from the machine table or part of the work

Multiple Scribing of Parallel Lines on Castings

By ROBERT S. ALEXANDER

Laying out large castings where several parallel lines are to be scribed usually calls for a number of height gages, which are not always available. The multiple scribing block illustrated was made to take care of just such situations. The cast-iron base is 6 in. in diameter and its bottom is recessed to minimize friction. Six equally spaced holes are drilled and reamed near the outer edge to receive the spindles, leaving enough room for tapped holes for set-screws to hold the spindles in place. The spindles are made of cold-rolled steel and are shouldered at the base for security against vertical slippage. The scribers are made of drill rod and are held in collars secured to the spindles.



After the first of several parallel lines has been scribed, a part turn of the block presents a scriber to the work for scribing the next line

In use, where many castings of the same kind are to be laid out, the parallel lines on the first casting are scribed by a vernier height gage. Then the scriber points on the multiple block are set to the scribed lines by the aid of a magnifying glass and are ready for scribing the lines on the other castings in the lot. If two or more scriber points have been set to heights close enough together to be confusing, a tag having the height plainly marked on it is placed on each of the spindles. Having six height gages on one block where many parallel lines are to be scribed on each of a lot of castings of the same kind is a time saver in any shop, since it eliminates either reaching for individual gages or repeatedly setting one vernier height gage for all the lines on each casting.

Tetrachloride As a Cleaning Spray

By L. F. SOUTHWICK

Carbon tetrachloride contained in a bottle equipped with a plunger-pump spray nozzle can be used for removing cutting compound from small parts or for blowing oily chips out of holes. If a small quantity of heavy grease or an all-oil lubricant that contains no soap stock (Mobilgrease No. 2 is excellent) is dis-

solved in the carbon tetrachloride and the mixture is sprayed on firm-joint calipers, stacks of feeler gages, micrometers, dividers and other tools having movable parts, it not only coats them with a thin but tough rust-proof film that is hardly noticeable, but which lubricates the movable parts. Nothing equals its effectiveness for lubricating the movable parts of locks and electric switches. Switches work better and last longer if copper-to-copper galling of the contacts is reduced. The compound is neither inflammable nor explosive.

Square Holes in Machine Table are Broached

By WALTER G. PORTER

General Manager, Porter Machine Company

In designing and building a special bench-type milling machine, one of the requirements of the customer was that in addition to the table having four T-slots running the full length, it was to have a series of $1\frac{1}{4}$x$2\frac{1}{2}$-in. rectangular holes for stops, their lengthwise direction to be parallel with the T-slots within 0.001 in. and both dimensions of the rectangle to be within plus or minus 0.002 in. The table is shown in Fig. 1. The rectangular holes *A* were cored, leaving $\frac{1}{8}$ in. all around for finishing. The vents *B* in the sides were also cored but not finished, the edges being chamfered with a file to give a finished appearance.

How to finish the rectangular holes within the limits for size and parallelism was quite a problem. After some experimenting it was decided to finish

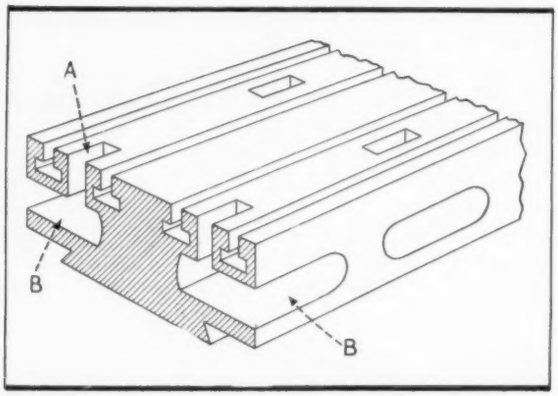


Fig. 1—The rectangular cored holes in this milling machine table were to be finished to specified dimensions and their long sides were to be parallel with the T-slots in the bed within very close limits

the holes by broaching, using the fixture illustrated in Fig. 2. It has two uprights *A* which are attached to the table by long bolts and having tongues on the bottoms to fit snugly into the T-slots; the crosspiece *B*; the operating screw *C* having a pitch of $\frac{1}{4}$ in.; the ball thrust bearing *D*; the hardened and ground bearing block *F* to keep the long side of the broach parallel with the T-slots against the turning moment of the operating screw; and the broach *H* which is attached to the lower end of the operating screw by the dog point of a setscrew engaging an annular groove.

The hole in the crosspiece for the operating screw was bored while the fixture was attached to the table. Four taps—three roughing and one finishing—were used in tapping the hole. Three broaches were used—two for roughing and one for finishing. They were made of high-speed steel, hardened to 60–65 Rockwell C and then ground. The roughing broaches had

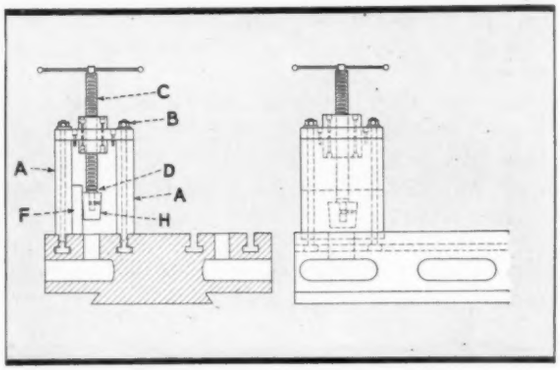


Fig. 2—The fixture is located by tongues on the bottoms of the uprights and the broach is kept in alignment with the T-slots by a single hardened and ground bearing block of high-speed steel

diagonal teeth, but the teeth in the finishing broach were straight. All the broaches were slightly tapered.

In operation, the broaches were forced through the holes by turning the operating screw. To prevent the spaces between the teeth from being clogged with chips, the roughing broaches were forced through the holes in three stages of about $\frac{1}{2}$ in. each, being removed and cleaned between stages. Since the finishing broach had to remove very little stock, it was forced through the holes without stopping.

Triangular Center for Taper Filing

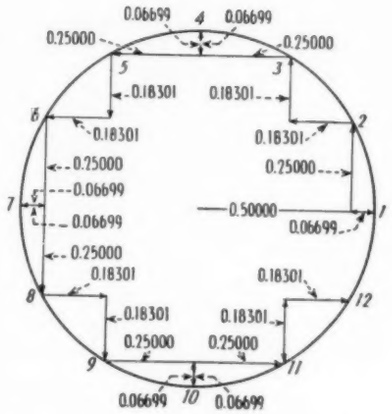
By MATTHEW HARRIS

A triangular center for replacing a dog and to be used when finish filing tapers was recently described by Arthur Havens (*AM*—Vol. 83, page 1046). It can be used only where light cuts are taken on work of small diameter that can be finished at one setting. Its driving function is entirely dependent upon grooves sunk in the countersunk hole for the live center, either by forcing it on the center by the tailstock spindle or by driving a triangular punch into it.

The center can not be trued in place as can an ordinary center, so it is not likely to run dead true. That and the possibility of the indented grooves not being equal in depth will cause the work to run out of true if it is removed from the center and is not put back in the same position it was in when the last cut was taken. Putting the work on the center and trying to find its original position thereon will take as much or more time than putting on and taking off a dog.

Hole Circle Layouts—I

BY W. J. WOODWORTH



Layout of 12 holes on a 1-in. circle can be done accurately by using the horizontal and vertical movements here shown. Horizontal and vertical movements for laying out different numbers of holes on circumferences of circles are given in the tables

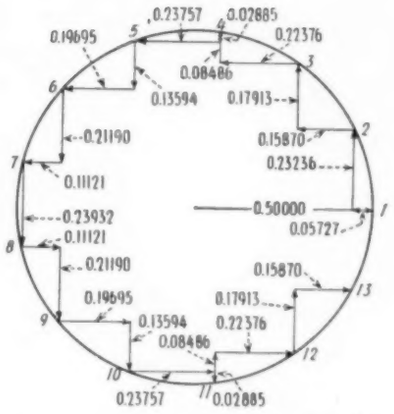
THE FOLLOWING TABLES are for accurate layout of holes on a given circumference. The values given are constants for a 1-in. circle. For larger or smaller circles, multiply the values by the diameter of the given circle. All values are given in ten-thousandths of an inch.

The tables are useful on precision machines, particularly the jig borer. They are to be used as follows:

Have the work fastened in position and locate the true center. Then move to the right a distance equal to the radius of the circle to be divided. Bore hole No. 1. Then move horizontally to the left the required number of ten-thousandths for hole No. 2. Follow this by moving vertically the required number of ten-thousandths for hole No. 2, thus locating this hole. Repeat these horizontal and vertical movements, locating each hole in turn. At each outer intersection bore the hole, and repeat until the circle is complete.

For example, in laying out 12 holes on a 1-in. circle as shown in one of the drawings, Hole No. 1 is bored 0.5000 in. to the right of the center. Hole No. 2 is located by first moving 0.06699 in. to the left and then 0.2500 in. vertically. Hole No. 3 is located by moving 0.18301 in. horizontally to the left and 0.18301 in. vertically. This is repeated, using the proper constants, for locating hole No. 4. But when locating hole No. 5, move vertically downward 0.06699 in. and then horizontally to the left 0.2500 in. This is repeated for holes Nos. 6 and 7, using the proper constants. Hole No. 8 is located by moving horizontally to the right 0.06699 in. and then vertically downward 0.2500 in. Thus in laying out the holes on the circumference, the mechanic must observe whether the next movement is vertically upward or downward, or horizontally left or right. He selects the proper movement by observing the development of the circle as the holes are bored.

Hole No.	*Horizontal*	*Vertical*
Three holes:		
1	0.50000	.....
2	0.75000	0.43301
3	.....	0.86602
Five holes:		
1	0.50000	.....
2	0.34549	0.47553
3,5	0.55902	0.18164
4	.....	0.58778
Six holes:		
1,3,6	0.50000	.....
2,4,5	0.25000	0.43301
Seven holes:		
1	0.50000	.....
2	0.18826	0.39091
3,7	0.42300	0.09655
4,6	0.33923	0.27052
5	.....	0.43388
Eight holes:		
1	0.50000	.....
2,5,6	0.14645	0.35355
3,4,7,8	0.35355	0.14645
Nine holes:		
1	0.50000	.....
2	0.11698	0.32139
3,9	0.29620	0.17101
4,8	0.33682	0.05939
5,7	0.21984	0.26200
6	.....	0.34202
Ten holes:		
1	0.50000	.....
2,6,7	0.09549	0.29389
3,5,8,10	0.25000	0.18164
4,9	0.30902	.....
Eleven holes:		
1	0.50000	.....
2	0.07937	0.27032
3,11	0.21292	0.18450
4,10	0.27887	0.04009
5,9	0.25626	0.11704
6,8	0.15233	0.23701
7	.....	0.28172



Layout of 13 or any other number of holes on a 1-in. circle is done by selecting the proper horizontal and vertical movement from the tables. For larger or smaller circles, multiply the tabulated values by the diameter of the given circle. Note that for some circles the numbers start repeating at approximately 90 deg., for others at approximately 180 degrees

Hole No.	*Horizontal*	*Vertical*
Twelve holes:		
1	0.50000	.....
2,7,8	0.06699	0.25000
3,6,9,12	0.18301	0.18301
4,5,10,11	0.25000	0.06699
Thirteen holes:		
1	0.50000	.....
2	0.05727	0.23236
3,13	0.15870	0.17913
4,12	0.22376	0.08486
5,11	0.23757	0.02885
6,10	0.19695	0.13594
7,9	0.11121	0.21190
8	.....	0.23932
Fourteen holes:		
1	0.50000	.....
2,8,9	0.04951	0.21694
3,7,10,14	0.13875	0.17397
4,6,11,13	0.20048	0.09655
5,12	0.22252	.....
Fifteen holes:		
1	0.50000	.....
2	0.04323	0.20337
3,15	0.12221	0.16820
4,14	0.18005	0.10396
5,13	0.20677	0.02173
6,12	0.19774	0.06425
7,11	0.15451	0.13912
8,10	0.08456	0.18994
9	.....	0.20790
Sixteen holes:		
1	0.50000	.....
2,9,10	0.03806	0.19134
3,8,11,16	0.10839	0.16221
4,7,12,15	0.16221	0.10839
5,6,13,14	0.19134	0.03806

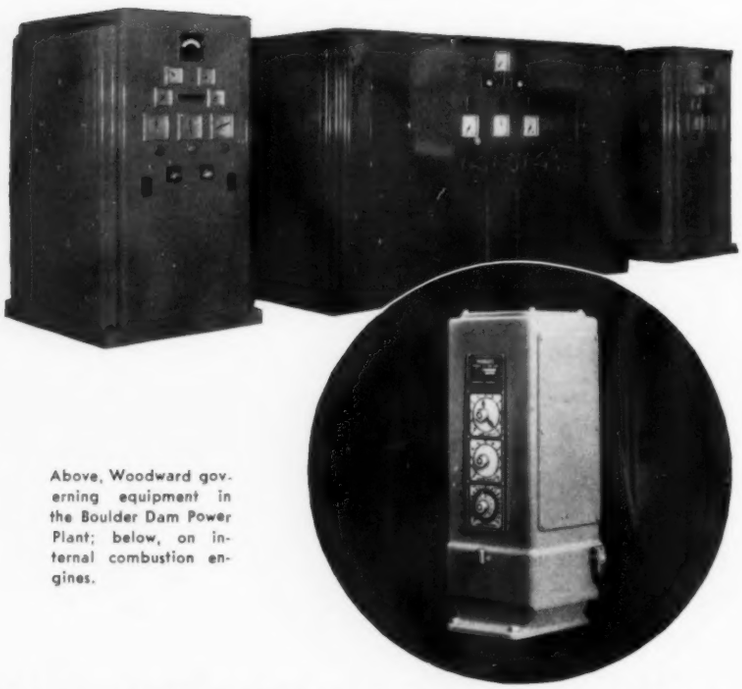
Accurate Cost and Production Control

"at a great saving" in time, labor and supervision with

McCASKEY

"Our initial McCaskey installation provided cost and production control and its advantages became apparent very soon. Accurate cost and production records were more readily available at a great saving in the time and labor required to keep the records. The status of every production order in process was made apparent at a glance.

"Our subsequent installation of the McCaskey system of machine loading has minimized the supervision necessary to assure production in the proper sequence for assembly requirements and shipping schedules. We are very well pleased with the results which have been obtained."



Above, Woodward governing equipment in the Boulder Dam Power Plant; below, on internal combustion engines.

This experience of The Woodward Governor Co., Rockford, Ill., outlined by Mr. Ward Ring, Supt., suggests how McCaskey Industrial Controls might simplify production planning and control in your plant. Woodward governors control the speed of water wheels, internal combustion and steam engines and turbines, and the pitch of adjustable blade airplane propellers.

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THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

Hole Circle Layouts—I

Hole No.	Horizontal	Vertical
Seventeen holes:		
1	0.50000	.....
2	0.03377	0.18062
3,17	0.09672	0.15623
4,16	0.14664	0.11073
5,15	0.17674	0.05028
6,14	0.18296	0.01695
7,13	0.16449	0.08190
8,12	0.12379	0.13580
9,11	0.06637	0.17134
10	.....	0.18374
Eighteen holes:		
1	0.50000	.....
2,10,11	0.03016	0.17101
3, 9,12,18	0.08682	0.15038
4, 8,13,17	0.13302	0.11162
5, 7,14,16	0.16318	0.05939
6, 15	0.17364	.....
Nineteen holes:		
1	0.50000	.....
2	0.02709	0.16235
3,19	0.07834	0.14475
4,18	0.12110	0.11148
5,17	0.15073	0.06612
6,16	0.16403	0.01358
7,15	0.15956	0.04039
8,14	0.13779	0.09003
9,13	0.10110	0.12989
10,12	0.05344	0.15567
11	.....	0.16460
Twenty holes:		
1	0.50000	.....
2,11,12	0.02447	0.15451
3,10,13,20	0.07102	0.13938
4, 9,14,19	0.11062	0.11062
5, 8,15,18	0.13938	0.07102
6, 7,16,17	0.15451	0.02447
Twenty-one holes:		
1	0.50000	.....
2	0.02221	0.14738
3,21	0.06467	0.13428
4,20	0.10138	0.10925
5,19	0.12908	0.07452
6,18	0.14530	0.03317
7,17	0.14862	0.01114
8,16	0.13874	0.05445
9,15	0.11652	0.09293
10,14	0.08397	0.12314
11,13	0.04393	0.14242
12	.....	0.14904
Twenty-two holes:		
1	0.50000	.....
2,12,13	0.02025	0.14086
3,11,14,22	0.05912	0.12946
4,10,15,21	0.09321	0.10755
5, 9,16,20	0.11971	0.07695
6, 8,17,19	0.13655	0.04009
7, 18	0.14232	.....
Twenty-three holes:		
1	0.50000	.....
2	0.01854	0.13490
3,23	0.05425	0.12489
4,22	0.08593	0.10562
5,21	0.11125	0.07853
6,20	0.12830	0.04560
7,19	0.13585	0.00930
8,18	0.13331	0.02771
9,17	0.12091	0.06264
10,16	0.09951	0.09295
11,15	0.07076	0.11634
12,14	0.03673	0.13112
13	.....	0.13616

Hole No.	Horizontal	Vertical
Twenty-four holes:		
1	0.50000	.....
2,13,14	0.01704	0.12941
3,12,15,24	0.04995	0.12059
4,11,16,23	0.07946	0.10355
5,10,17,22	0.10355	0.07946
6, 9,18,21	0.12059	0.04995
7, 8,19,20	0.12941	0.01704
Twenty-five holes:		
1	0.50000	.....
2	0.01508	0.12434
3,25	0.04677	0.11653
4,24	0.07367	0.10140
5,23	0.09657	0.07989
6,22	0.11340	0.05337
7,21	0.12312	0.02348
8,20	0.12508	0.00787
9,19	0.11920	0.03873
10,15	0.10582	0.06716
11,17	0.08580	0.09136
12,16	0.06038	0.10983
13,15	0.03116	0.12140
14	.....	0.12532
Twenty-six holes:		
1	0.50000	.....
2,14,15	0.01454	0.11966
3,13,16,26	0.04273	0.11270
4,12,17,25	0.06848	0.09920
5,11,18,24	0.09022	0.07993
6,10,19,23	0.10673	0.05601
7, 9,20,22	0.11703	0.02885
8, 21	0.12054	.....
Twenty-seven holes:		
1	0.50000	.....
2	0.01348	0.11530
3,27	0.03971	0.10910
4,26	0.06379	0.09699
5,25	0.08444	0.07967
6,24	0.10054	0.05805
7,23	0.11121	0.03329
8,22	0.11589	0.00675
9,21	0.11433	0.02016
10,20	0.10660	0.04598
11,19	0.09312	0.06933
12,18	0.07462	0.08893
13,17	0.05210	0.10374
14,16	0.02678	0.11297
15	.....	0.11608
Twenty-eight holes:		
1	0.50000	.....
2,15,16	0.01254	0.11126
3,14,17,28	0.03697	0.10568
4,13,18,27	0.05958	0.09480
5,12,19,26	0.07917	0.07917
6,11,20,25	0.09480	0.05958
7,10,21,24	0.10568	0.03697
8, 9,22,23	0.11126	0.01254
Twenty-nine holes:		
1	0.50000	.....
2	0.01169	0.10749
3,29	0.03453	0.10246
4,28	0.05573	0.09263
5,27	0.07436	0.07850
6,26	0.08949	0.06067
7,25	0.10044	0.04002
8,24	0.10669	0.01750
9,23	0.10796	0.00586
10,22	0.10418	0.02892
11,21	0.09552	0.05065
12,20	0.08240	0.06999
13,19	0.06544	0.08607
14,18	0.04539	0.09813

Hole No.	Horizontal	Vertical
15,17	0.02325	0.10559
16	.....	0.10812
Thirty holes:		
1	0.50000	.....
2,16,17	0.01093	0.10395
3,15,18,30	0.03230	0.09942
4,14,19,29	0.05226	0.09052
5,13,20,28	0.06995	0.07768
6,12,21,27	0.08456	0.06144
7,11,22,26	0.09549	0.04252
8,10,23,25	0.10225	0.02173
9, 24	0.10452	.....
Thirty-one holes:		
1	0.50000	.....
2	0.01023	0.10065
3,31	0.03029	0.09653
4,30	0.04910	0.08845
5,29	0.06589	0.07676
6,28	0.08000	0.06193
7,27	0.09084	0.04456
8,26	0.09794	0.02535
9,25	0.10103	0.00513
10,24	0.10001	0.01533
11,23	0.09487	0.03513
12,22	0.08585	0.05351
13,21	0.07333	0.06970
14,20	0.05779	0.08304
15,19	0.03990	0.09297
16,18	0.02036	0.09910
17	.....	0.10116
Thirty-two holes:		
1	0.50000	.....
2,17,18	0.00961	0.09754
3,16,19,32	0.02845	0.09380
4,15,20,31	0.04621	0.08644
5,14,21,30	0.06218	0.07577
6,13,22,29	0.07577	0.06218
7,12,23,28	0.08644	0.04621
8,11,24,27	0.09380	0.02845
9,10,25,26	0.09754	0.00961
Thirty-three holes:		
1	0.50000	.....
2	0.00904	0.09462
3,33	0.02677	0.09121
4,32	0.04356	0.08449
5,31	0.05876	0.07472
6,30	0.07184	0.06224
7,29	0.08232	0.04754
8,28	0.08983	0.03108
9,27	0.09409	0.01353
10,26	0.09495	0.00452
11,25	0.09237	0.02241
12,24	0.08647	0.03949
13,23	0.07743	0.05514
14,22	0.06560	0.06879
15,21	0.05138	0.07997
16,20	0.03534	0.08825
17,19	0.01799	0.09333
18	.....	0.09506
Thirty-four holes:		
1	0.50000	.....
2,18,19	0.00852	0.09187
3,17,20,34	0.02525	0.08875
4,16,21,33	0.04112	0.08259
5,15,22,32	0.05560	0.07364
6,14,23,31	0.06819	0.06216
7,13,24,30	0.07845	0.04857
8,12,25,29	0.08604	0.03333
9,11,26,28	0.09070	0.01695
10, 27	0.09226	.....

Tabulated dimensions for laying out 35 and more holes will be in the next issue.

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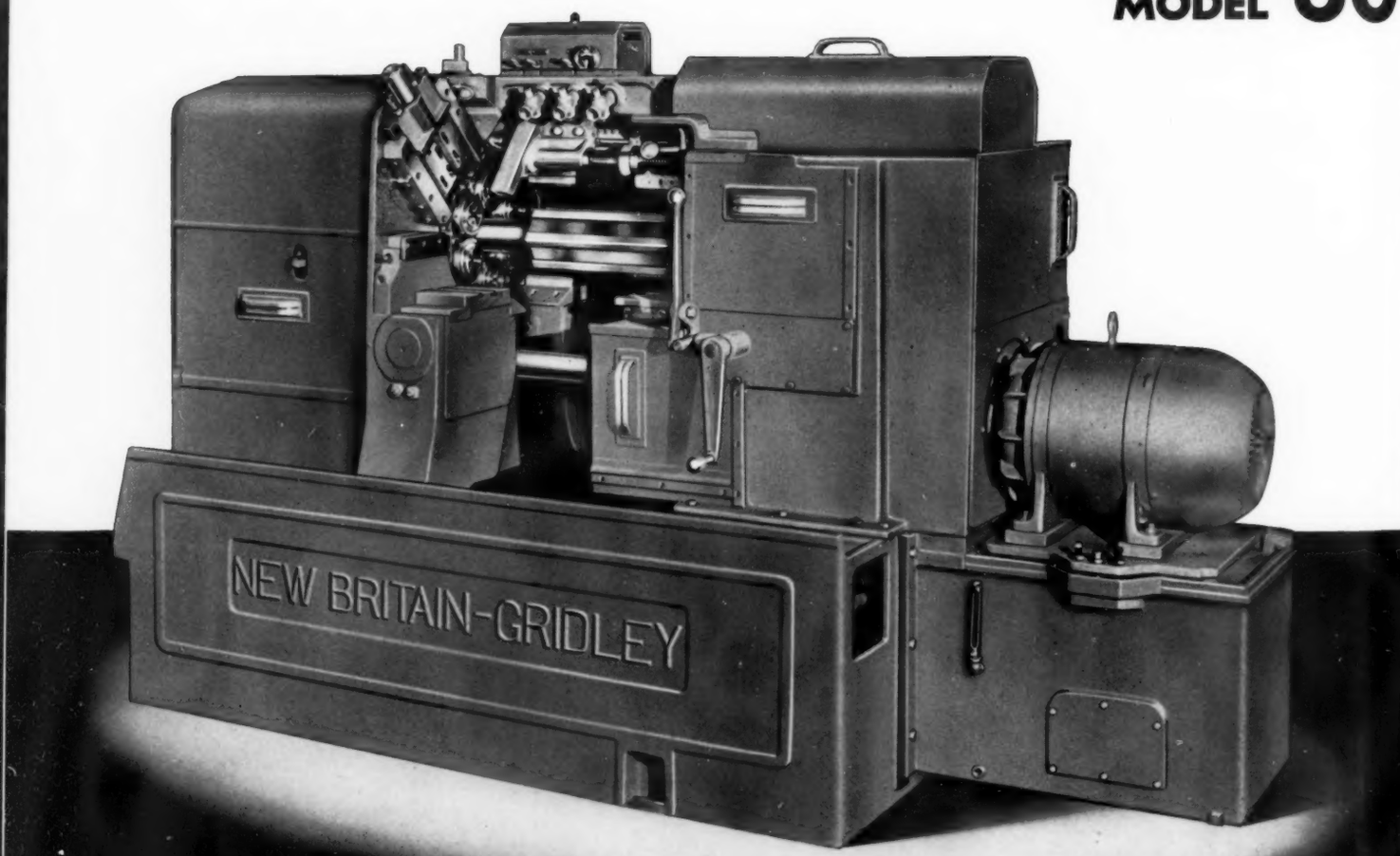
MODEL 60



A complete line of Screw Machines — Four and Six Spindles to 2¼" Capacity
Also a complete line of Chuckers — Four, Six and Eight Spindles to 10¼" Capacity

Bewildered, Not Lost!

A FOREST RANGER from one of our western parks was telling about his buddies. He said that they boast about never getting lost. But, added the ranger, "I know of several times when a ranger was bewildered for two or three days at a stretch."

When it comes to training skilled men, American industry is in much the same position as the self-confident rangers. It may not be lost, but it obviously is bewildered. It doesn't seem to have the slightest notion of what direction to take.

Let's look into the situation for a moment. The airplane industry has been short of skilled men. In some cases it is reported to have gone hundred of miles away to get tool and die makers and experienced machinists. The machine tool industry has about exhausted its available supply of trained mechanics.

In Canada the demand for good all-around machinists may soon go unsatisfied under war conditions. Our own War Department has warned that in a national emergency we shall find ourselves handicapped by lack of skilled metal workers. And who can say confidently that we may not get sucked into the present world war some day?

Conclusive proof exists, then, that a shortage is at hand in some lines and looms in others. But what are we doing about it? Not much more than talk! It is like the Allies pledging aid to Poland and Finland.

We salute those valiant managements who have had the courage and vision to carry on apprentice training without interruption through the years. But for every one of them there are thirty which are doing next to nothing. If they do anything at all, they blow hot and cold.

When times are good, in a burst of enthusiasm they start a training program. If it is a real apprentice course, the youngsters are graduated after the business peak is passed. Then the company begins to retrench; and one of the first items to be eliminated is training. Instead of taking the opportunity to teach young men in slack times so that they will be ready for the next upturn, the company comes up to a period of expansion unprepared.

Some progress is being made in apprentice training by such organizations as the Federal Committee on Apprenticeship and the National Metal Trades Association. But not enough. What is needed is a coordinated national program.

If the federal government insists upon spending millions for youth relief movements, why not earmark some of the money for the training of honest-to-goodness mechanics? Is there any valid reason why C.C.C. boys should be limited to building trails through the woods? What about the National Youth Administration? At least some of the young people it helps might profitably be taught the dignity and expert craftsmanship of the machinists' trade.

At the same time the metal-working industry should intensify its efforts voluntarily to train apprentices on a regular basis.

The industry, like the ranger, may not admit it is lost. But surely action is needed, and prompt action, to bring it out of its bewilderment in the matter of training men.

As someone has said, "It is a disgrace to this country that a shortage of skilled men should be allowed to develop when millions of men still are unemployed."

Burnham Finney

GAGING BUSINESS

Machine tool orders from aircraft engine makers insure April of being a top month. March bookings close to those of February. Allison Division of General Motors to enlarge capacity

Operations in many branches of the metal-working industry have been maintained at a high level the past two weeks. That is particularly true of companies affected by national defense needs and by export orders from the Allies.

Machine Tools—Final check-up of March bookings shows that they were almost on a par with those in February and in January. Though foreign orders were of impressive volume, the percentage of domestic business is worthy of mention. In at least one case a leading builder reports sales the past 30 days at a ratio of about two for domestic to one of foreign. The industry is continuing to make a deliberate effort to favor U. S. customers as against export buyers. The long-awaited orders from aircraft engine makers in connection with further expansion of their productive capacity are now filtering through and should come with a rush during the next week. This chunk of business alone, from Wright Aeronautical and Pratt & Whitney Aircraft as well as from parts manufacturers, assures April of being one of the top months in sales. Demand for machines from companies making peace-time products has quickened. Many companies have intermittent gaps in their production schedules enabling them to take orders for a limited number of machines for delivery within four to five months. Conservative expansion of plant capacity is now in progress here and there in the industry. No headway is being made, however, in cutting down huge backlogs of accumulated orders. Builders are quoting foreign customers deliveries as far distant as the second quarter of 1941 on certain types of machines. England and France continue the most important export buyers.

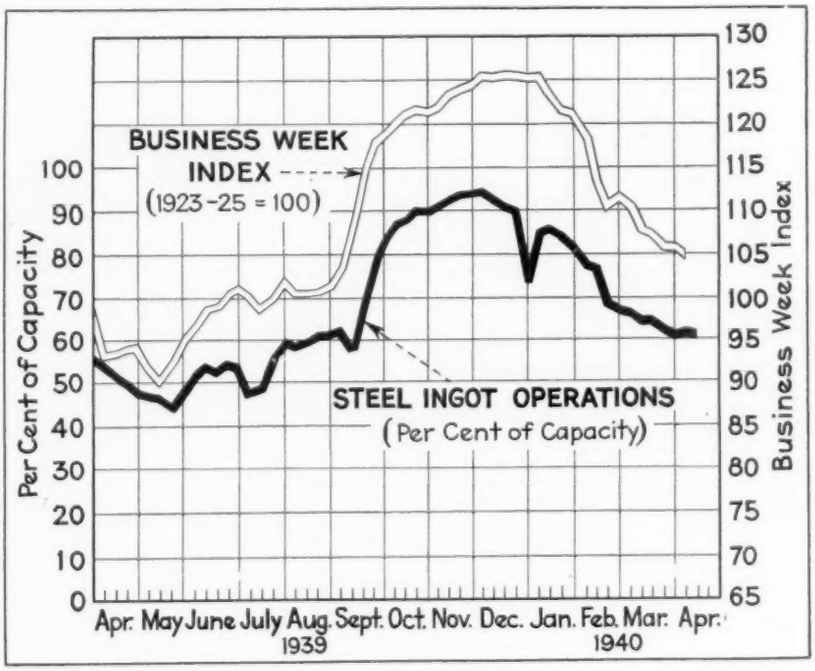
Aircraft—The U. S. Army's permission for export of three of the latest model pursuit planes — Lockheed P-38, Bell P-39 and Curtis P-40D—is believed to have cleared the way for the British and French to order U. S. planes and engines which may eventually amount to one billion dollars. Recent expasion of plane building capacity now enables the industry to turn out $50,000,000 of planes a month. Wright Aeronautical and Pratt & Whitney Aircraft are expected to proceed immediately with a second program of enlargement of plant capacity. This is on top of a program now under way. Allison Division of General Motors also is ready to tool up for bigger production of high-powered engines. The Army has contracted with Boeing for 50 flying fortresses to cost $8,000,000. These huge bombers have not yet been released for export purchasing.

Railroad Equipment—First quarter buying lagged behind 1939 by 550 freight and 87 passenger cars. Orders for 86 locomotives were ahead of a year ago by 12 units. Domestic inquiries for several thousand cars and sizable foreign orders for cars and locomotives are pending. The New York Central has purchased 1,500 hopper cars from its subsidiary, Dispatch Shops, Inc., 35 locomotives from American Locomotive and 15 locomotives from Lima Locomotive Works at a total cost of $10,000,000. Backlogs of car builders continue to shrink as their plants operate at a good rate on orders placed last fall.

Gears—Sales in March were about 2 per cent below February and 9.6 per cent better than in the corresponding month of last year. First quarter bookings were 25.6 per cent above the same period of 1939.

Farm Equipment—Cash in farmers' hands means machinery buying, and indications are that Congress intends to do its share to keep up farm income. Latest competitor in the combine field is J. I. Case with a 54-in. model, which is slightly larger and higher in price than International Harvester's new 4-ft. combine. Oliver Farm Equipment is promising a 5-ft. combine for delivery this month. Exports are gaining, as demonstrated by a 16 per cent increase in February compared with the same month of 1939.

Steel—The long decline which began last Fall in steel operations has finally been halted, and ingot output is being stabilized around 60 per cent. Incoming orders, which for months have been far below production, have risen much closer to mill shipments. Export business is on the upgrade.



Intensified Warfare Speeds Plane Orders

After dawdling for weeks, Allied Mission is now ready to order new types of aircraft just released for foreign deliveries by Army and Navy. About 1,200 planes will be bought immediately

WASHINGTON—Outbreak of active fighting in Scandinavia has thrown wide open the dawdling aircraft export situation. The Allied Purchasing Commission, not having any use for airplanes at the moment and knowing that the longer it waited the better ships it would be able to buy, had not been pushing very hard the negotiations with the War Department intended to straighten out details of the new release policy. But a few days before Germany entered Denmark, when it was becoming clear something would break, the heat was really turned on. The negotiators got down to business and Lockheed P-38's, Bell P-39 Airocobra's and Curtiss-Wright P-40's were released. Report is that 1,200 of these three types will be bought.

Prospects for comparatively early deliveries are good. Production lines now rolling out planes for the U. S. can be switched over to export work. The backlog of unfilled military export orders amounts to about 3,350 units, which won't take long to run off at present production rates. Of the 1,400 or so ships a month now being produced, about 400 are commercial types (mostly flivvers), perhaps 200 are for our armed forces (this will decrease in the future) and the remaining 800 is for military export. And production is rising fast.

The engine bottleneck—with a 500–900 a month deficiency—is beginning to clear up. Allison, whose liquid cooled, high-horsepower V-type engines are incorporated in several of the newest fighters, plans to double its capacity soon, bring it up to something like 600 engines a month—a 300 unit increase. Cadillac Motor and AC spark plug divisions of general motors make parts of the Allison engine and will benefit from the projected plans.

ALLIED MUNITIONS ORDERS SMALL

WASHINGTON — Orders for munitions totaling less than $7,000,000 has been placed in the United States by the Allies since the opening of the war, according to authoritative sources. This amount is exclusive of aircraft and aircraft parts. About one-fourth of the total is reported to be for searchlights in connection with anti-aircraft operations. A considerable percentage of the contracts have been for explosives. Shell orders have been few in number. The British are securing shells from an eastern company and the French are getting anti-aircraft shells from another company. No immediate pick-up is expected in shell contracts, despite the increased intensity of the war.

New Educational Orders Near $1,000,000 Mark

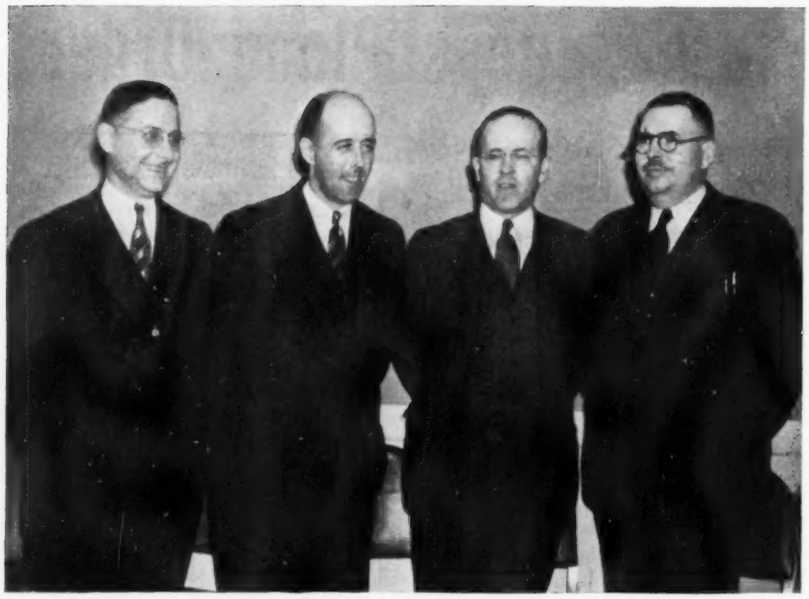
WASHINGTON—The War Department has announced $822,015.31 worth of new educational orders. Those for the Ordnance Department were awarded to the following companies: Walter Scott and Company for recoil mechanisms, $445,563.14; General Iron Works for machining shells and related items, $115,455; Van Dorn Iron Works Company for light tank hulls and related items, $185,244.85. Orders for wire and related items, intended for the Signal Corps, went to General Electric Company, $5,385.60; Belden Manufacturing Company, $6,916.80; Collyer Insulated Wire Company, $5,760.40; Crescent Insulated Wire & Cable Company, $4,919.80; Rome Cable Corporation, $7,249.44; John A. Roebling's & Sons Company, $6,148.30; Circle Wire & Cable Company, $8,620; Anaconda Wire & Cable Company, $4,783.68; Phelps Dodge Copper Products Corporation, $7,455.04; United States Rubber Company, $6,781; American Steel & Wire Company, $6,864; Hazard Insulated Wire Works Division, The Okonite Company, $4,868.16.

Wide World

Have a Look!—*Everybody in the above picture seems intent on examining these shell cases, produced in one of the largest factories in South Wales. And well they might, if information passed by the British censor is true: "Not too long ago about 99 per cent of its personnel of 1,100 had never seen cartridge cases in course of manufacture."*

Continuing Study of Labor Productivity to Be Made

WASHINGTON—A new division of Labor Productivity would be set up in the Bureau of Labor Statistics of the U. S. Department of Labor if the Senate passes a bill just approved by the House. The task of the new division would be to make a continuing study of the effects of technical developments on the productivity and displacement of human labor. The bill, which is likely to be approved in the Senate, is sponsored by the A.F.L. Congress will have to vote funds later.



Head New A.S.T.E. Chapter—*Chapter No. 33 of the American Society of Tool Engineers got off to a good start in Boston on March 22, when 200 men attended the charter meeting. First officers are, from left, A. D. Forbes, General Electric Co., chairman; C. A. Lockwood, United Shoe Machinery Corp., vice-chairman; William A. Young, Pratt & Whitney, secretary; and J. W. Geddes, H. K. Porter Co., treasurer. A. H. d'Arcambal, national president, was in charge of the group's first meeting*

Canadian Plant Expansion Increases As War Orders Rise

OTTAWA—A newly created Ministry of Munitions and Supplies under Minister of Transport Howe has taken over the functions of the Canadian War Supply Board. Wallace R. Campbell, president of Ford of Canada, has resigned as Chairman of the Board because his services no longer will be needed under the consolidated set-up.

Canadian plants are increasing their production facilities to meet new orders for war materials resulting from intensified action in the war. A new shipbuilding company headed by James Francheschini of Toronto has received an order for construction of mine-sweepers costing $3,500,000. Robert Mitchell Co., Ltd., Montreal, has nearly completed extensive additions to its plant and equipment, to fill munitions and other war contracts recently received.

Canadian Associated Aircraft, Ltd., following receipt of a $30,000,000 order for bombers (previously a $10,000,000 order had been received), has launched extensions to its assembly plants at St. Hubert, Que., and Malton, Ont. Construction cost at each plant will be $100,000.

Recent government awards for aircraft supplies include $433,786 to Hughes-Owen Co., Ltd., Ottawa; $220,773 to Instruments, Ltd., Ottawa; $997,704 to Pratt & Whitney Aircraft, Longueuil, Que.; and $133,123 to Fairchild Aviation Corp., Jamaica, N. Y.

MORE FACTORIES FOR MANCHUKUO

TOKYO—The Manchukuo Government has earmarked about $122,000 for the transplanting of 42 Japanese factories to Manchuria. Last year, half this number was moved to the continent, mainly repair shops and plants for the manufacture of agricultural implements, automobile parts and mining machinery.

Japan's Imports of Machines Limited By Trade Troubles

TOKYO—There are unmistakable indications that Japanese plant expansion plans have suffered a set-back as a result of the United States abrogating its trade treaty with Japan. In view of the uncertainty regarding an American embargo on "implements of war," and whether or not it will be defined to include metalworking machinery, both Japanese buyers and American sellers are sitting pat, awaiting developments.

New expansion plans are few and far between, and always conditional upon smooth delivery of American tools. But some expansion has been authorized in recent months. The most important are as follows:

Niigata Iron Works, one of the "big five," has applied for authorization to double its share capital to $10,000,000. Plants at Niigata, Nagaoka, Kashiwazaki, Urawa and Kamata, producing machine tools, rolling stock, diesel engines and chemical equipment, are to be expanded if the project is licensed.

Ishikawajima Shipbuilding is planning to expand its aircraft engine plant at Sugita, near Yokohama, at a cost of $2,500,000.

Tokyo Automobile Industrial has been authorized to increase its capitalization to $17,500,000. Present capitalization is about $8,000,000. The firm specializes in tanks and trucks.

Tokyo Precision Machine, Shimo-Maruko, is planning to build a new plant to pioneer in precision tools of types not built in Japan.

The Railway Ministry has invited bids on $2,500,000 worth of machine tools. It is thought that Japanese makers are to supply 80 per cent, the balance to be imported from the United States.

U. S. Government Contracts Awarded to Tool Makers

(Other Metal-Working Contracts on Page 260j)

Contractor	Gov't Agency	Commodity	Amount
Bullard Co., Bridgeport, Conn	Navy	Boring machine	$11,823
William Sellers & Co., Inc., Philadelphia, Pa.	Navy	Planer, radial drills	143,200
South Bend Lathe Works, South Bend, Ind.	Navy	Engine lathes	72,575
Bodine Corp., Bridgeport, Conn	Ordnance	Drilling machines	11,925
Lodge & Shipley Machine Tool Co., Cincinnati, Ohio	Ordnance	Engine lathes	13,334
Utica Drop Forge & Tool Corp., Yorkville, N. Y.	Navy	Nippers, pliers	14,321
Hendey Machine Co., Torrington, Conn	Ordnance	Lathes	15,040
Gisholt Machine Co., Madison, Wis	Ordnance	Turret lathe	14,655
King Machine Tool Co., Cincinnati, Ohio	Navy	Boring machine	15,370
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio	Navy	Milling machines	19,418
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa	Navy	Hydraulic press	10,773
Brown & Sharpe Mfg. Co., Providence, R. I.	Ordnance	Milling machines	15,923
W. E. Shipley Machinery Co., Philadelphia, Pa	Ordnance	Gear hobber	12,200
Kearney & Trecker Corp., Milwaukee, Wis	Ordnance	Milling machines	53,548
Sebastian Lathe Co., Cincinnati, Ohio	QMC	Lathes	17,963
Service Tool & Engineering Co., Dayton, Ohio	Air Corps	Screwdrivers	18,968
Bunell Machine & Tool Co., Cleveland, Ohio.	Air Corps	Small tools	14,634
Steel Products Engineering Co., Springfield, Ohio	Air Corps	Special tools	11,944
Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn	Navy, Ordnance	Profile machine, lathes	35,125
Sidney Machine Tool Co., Sidney, Ohio	Navy	Lathes	32,516

INSIDE DETROIT

Truck activity increases; Reo resumes production with a new design, White plans to build units for the Allies. First installation of pneumatic multiple-spot welder made at Dodge

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—Final assemblies of 1½–6 ton trucks of a new design that permits more loading space will commence in the Reo Motor Co. plant in Lansing about the end of May, according to Claude Wood, treasurer. Following reorganization of the company on Jan. 2, the plant has been revamped and consolidated. Excess equipment, left over from the days when automobiles were manufactured, was eagerly grabbed up by the Allies at a comfortable premium over the appraised worth.

All tools needed for truck production had been received by the end of March, and machining operations were underway for the purpose of building up parts stocks. Eventually between 800-1,000 men will find employment. Output for the first three months of full operations—June, July and August—is expected to reach 1,800 units. There is reason to believe that production of 8,000 units—the break-even point—will be surpassed during the first year. This conclusion is based upon the fact that the dealer body both here and abroad is largely intact, and is reported anxious to resume selling operations. Factory representatives have already been sent into the field to acquaint dealers with the merits of the new line.

Besides trucks, Reo will continue to manufacture motor coaches. And it is likely that the firm will enter the school-bus market. While no diesel-powered model is now present in the truck line, it is considered probable that one will be made available within a few months.

Plane Parts Makers at Peak

Aircraft parts makers in this district already have their hands full with work destined eventually for the Allies, and are wondering how they can increase output further if the long-awaited billion-dollar plane order is finally placed. One large interest has already expanded production several times, and declares now that it will not increase production facilities again. Despite doubling its capacity three months ago, another outfit is again right on the "ragged edge" with current orders. Plans to expand further were not denied. A third large producer some miles distant from Detroit said all commitments have been met so far, but did not deny that rapidly expanding plane production will force an increase in production facilities.

White to Build Big Trucks for Allies

News that the White Motor Co. in Cleveland has received an order from the French for 145 six-wheeled trucks prompted an inquiry at Federal Motor Truck in Detroit. That company has not been approached recently in connection with such business, but it is reported having gratifying success with the 3—7½-ton models recently introduced. Registrations of Federal trucks during the first two months of 1940 are declared to be "very satisfactory," particularly since the percentage of gain is said to lead the field.

Ford Reviews Benefits to Labor

Assembly of the 28,000,000th Ford at the Edgewater, N. J. plant on April 8, was the signal for W. J. Cameron to reveal some astronomical figures concerning the significance of Ford operations. He said that 4,800,000,000 man-hours of employment have been given in the production of these 28,000,000 cars, that wages paid amounted to $4,230,000,000. The cost of materials for these cars was ten billion dollars.

The average annual wage of regularly employed Ford shop workers in 1939 was $1,674.15—higher than the national average. And the proportion of regularly employed hourly rate workers to the total was high.

Dodge Uses New Multiple Spot Welder

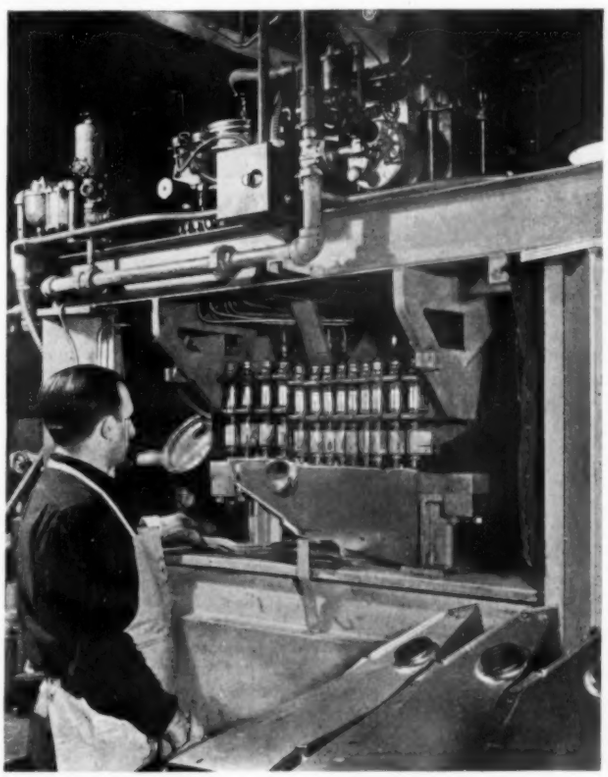
The first multiple spot-welding machine to embody pneumatic instead of hydraulic control has just been installed in the Dodge Division,

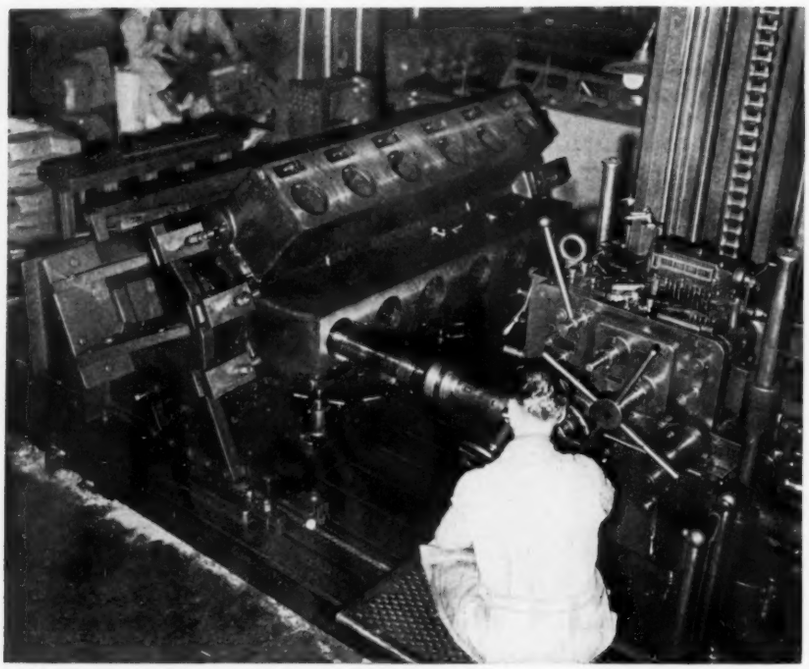
EQUIPMENT BUYING LIGHT

DETROIT—Retooling for the 1941 model season will not involve huge expenditures for new machine tools, though Ford recently has been an important buyer in connection with its proposed six. New equipment orders are mostly being confined to plugging up particularly weak spots in the production of five million cars a year, tens of millions of dollars were spent on plant expansions and improvements. General Motors alone erected new parts factories and remodeled others. The new capacity thereby created has not yet been fully used. That is a reason why machine tool buying at Detroit the last few years has been below normal.

Refinement

Reduced noise and absence of oily exhaust fumes are features appreciated by the operators of this pneumatically controlled multiple-spot welder, the first of its kind installed at Dodge





Three in One—*Machining cylinder liner holes in blocks for 500-hp. Cummins diesels is simplified by a boring bar which finishes three diameters at once. It does rough and finish cutting, counterboring, and recessing. Cam and spring mechanism automatically controls depth and location of cuts, which are held to within 0.002 in. Tools are Carboloy*

Chrysler Corporation. The machine is set up for assembling two components of an engine dustpan. Reduced noise and easy operation are among the many features which this machine possesses.

England and France Will Exchange Machine Tools

LONDON, ENGLAND—Machine tools suitable for production or war goods will be exchanged between Britain and France, according to plans revealed by Minister of Supply Burgin. The suggestion originated with the French Minister of Armaments. Mr. Burgin emphasizes that it is important that every machine tool in both countries be used to the utmost capacity. Hence it is believed that a program of exchanging machinery from one country to the other and putting machine tools to work where they are most needed will speed up the war effort.

Importance of Diesel in Nation's Economy Stressed By Kettering

WASHINGTON — Expanded application of the diesel engine to industry and use of modern technique in housing afford the best outlook for new industries which can do for the country what the automobile did for its economy in the twenties, asserted Charles F. Kettering, vice-president General Motors Corp., testifying before the T.N.E.C. The immediate trouble, he said, is the lack of projects into which the inventive force of the nation can set their teeth.

Two Tractor Manufacturers Share Profits With Employees

CHICAGO—Close on each other's heels follow the announcements of Caterpillar Tractor's first vacation-with-pay and International Harvester's profit-sharing plan.

Originally announced and put into action last October was Caterpillar's plan of boosting employees' pay four per cent for vacation purposes. Last week the company announced a vacation for the entire plant beginning July 28 and ending August 11. Before leaving, each employee will receive a check for the eight months' accumulated four per cent, average size of which is expected to be about $45. In the succeeding years the amounts will be higher than for this year because only eight months have elapsed since adoption of the plan.

International Harvester's profit-sharing and savings plan is more extensive and will involve millions of dollars. Briefly the plan is that the company will distribute to employees 25 per cent of all earnings in excess of $3 per share on the common stock, each employee to share in proportion to his salary or wages.

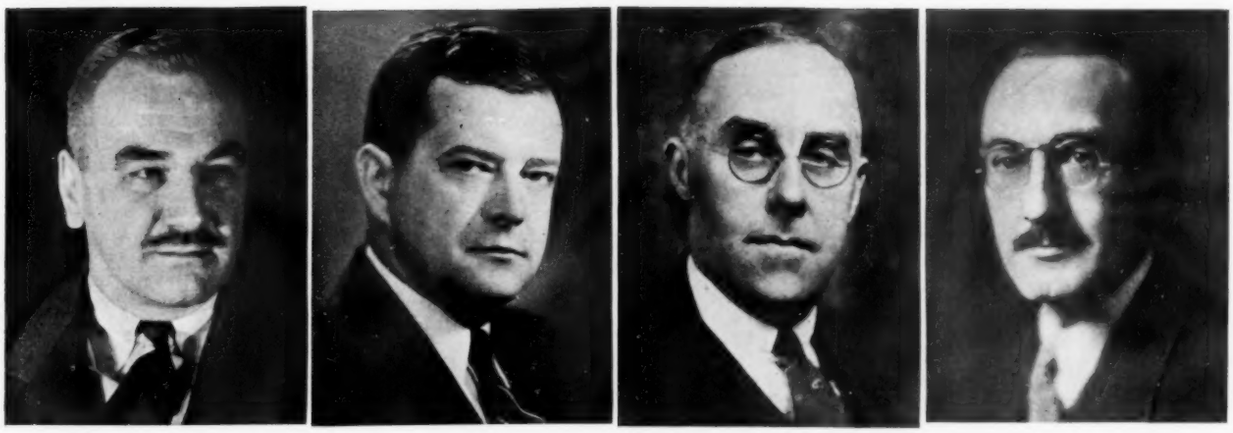
With a gross volume of business of more than $267,000,000 (in 1939) such a plan assumes large proportions. According to Sydney G. McAllister, president, "the plan will become effective May 1 and will apply to about 50,000 American and Canadian employees in all departments of the company."

Exports of Machinery During February, 1940

	February 1940	January 1940	February 1939
Electrical machinery	$9,253,949	$9,369,254	$6,954,372
Power generating machinery except automotive and electric	1,805,935	1,494,777	876,963
Construction and conveying machinery	1,983,992	1,637,647	1,765,537
Mining, well and pumping machinery	4,147,897	4,254,544	4,985,230
Power-driven metal-working machinery	13,691,528	12,844,084	7,832,893
Other metal-working machinery	652,745	655,533	307,018
Textile machinery	1,289,368	1,006,753	557,178

Metal-Working Machinery

Engine lathes	$1,103,333	$1,192,423	$607,586
Turret lathes	923,340	768,048	552,591
Other lathes	390,597	395,324	122,856
Vertical boring mills and chucking machines	912,798	602,560	290,461
Thread cutting and automatic screw machines	1,179,178	1,048,600	337,331
Knee and column type milling machines	632,397	727,579	427,722
Other milling machines	1,273,049	1,054,507	1,168,583
Gear cutting machines	435,265	573,570	283,964
Vertical drilling machines	154,914	108,115	95,259
Radial drilling machines	88,303	134,494	63,775
Other drilling machines	176,641	281,806	113,570
Planers and shapers	218,962	205,524	254,959
Surface grinding machines	272,731	334,832	218,805
External cylindrical grinding machines	609,286	496,233	304,243
Internal grinding machines	463,329	713,029	180,510
Tool grinding, cutter grinding, and universal grinding machines	382,093	641,767	145,435
Other metal-grinding machines and parts	686,829	635,482	576,646
Sheet and plate metal-working machines and parts	618,487	587,096	327,637
Forging machinery and parts	398,703	413,113	506,933
Rolling mill machinery and parts	852,075	1,429,833	675,551
Molding machines	37,004	20,733	8,242
Other foundry equipment and parts	67,127	60,493	39,578
Other power-driven metal-working machinery and parts	1,815,087	1,417,347	530,656
Pneumatic portable tools	195,052	186,310	81,084
Other portable and hand- or foot-operated metal-working machines and parts	153,371	172,229	86,817
Chucks for machine tools	26,647	31,591	17,548
Milling cutters, machine-operated threading dies, and taps and similar machine operated metal cutting tools	139,364	128,337	74,376
Other metal-working machine tools and parts	138,311	137,066	47,193



Among the speakers *at the I.A.A. meeting were, from left, J. H. Zimmerman, development manager Linde Air Products Co.; R. G. Rodgers, works manager Electrolux Div. of Servel, Inc.; R. H. Leach, vice-president Handy & Harman; and Dr. George V. Slottman, manager applied engineering department Air Reduction Sales Co. Mr. Zimmerman served as general chairman of the technical lecture and discussion session on machine flame-cutting, Mr. Rodgers discussed welding and brazing of light-gage metal, Mr. Leach presented a paper on low-temperature brazing with silver alloys, and Dr. Slottman took part in the discussion on machine-cutting*

International Acetylene Association Stresses Latest Developments in Machine Flame-Cutting

Henry Booth elected president; Otto C. Voss receives Morehead Medal

MILWAUKEE—Latest practices and developments in various applications of the oxy-acetylene process in American industry were the major topics under consideration at the annual convention of the International Acetylene Association held here April 10—12 at the Hotel Schroeder. Informal round-table meetings and a panel discussion on oxy-acetylene machine-cutting provided opportunities for discussing individual problems with welding and cutting experts, while five technical sessions afforded ample opportunities for delegates to keep posted on the finer points of gas welding progress.

On Wednesday afternoon, April 10, papers were presented at the first of the simultaneous sessions, on welding carbon-molybdenum pipe, welding industrial piping, and developments in silver-soldering. A fourth paper discussed layout and management of a modern welding shop. The second technical session on Wednesday was devoted to reclamation, repair and maintenance, and included papers on use of oxy-acetylene process for repair work in shipyards, foundries, steel mills, and railroad shops.

A panel discussion on oxy-acetylene machine-cutting was held Thursday afternoon. The subject was thoroughly discussed by a group of prominent engineers representing manufacturers and users of machine-cutting equipment, and was of particular interest in view of the increasing use within the past year of the oxy-acetylene cutting machine for the fabrication of steel parts.

The convention closed with two simultaneous technical sessions on Friday afternoon. Foundry and heavy industry applications of the oxy-acetylene process were under consideration at one session, with fabrication and production scheduled for the second technical session.

Otto C. Voss, tank and plate shop advisory superintendent, Allis-Chalmers Mfg. Co., received the Morehead Medal, awarded annually by the association to the person who, in the opinion of its officers, has "done most to advance the industry or the art of producing or utilizing calcium carbide or its derivatives." It was under Mr. Voss' direction that the first oxy-acetylene welded pressure vessels to pass the codes of regulatory bodies and testing organizations were produced.

NEW I.A.A. OFFICERS ELECTED

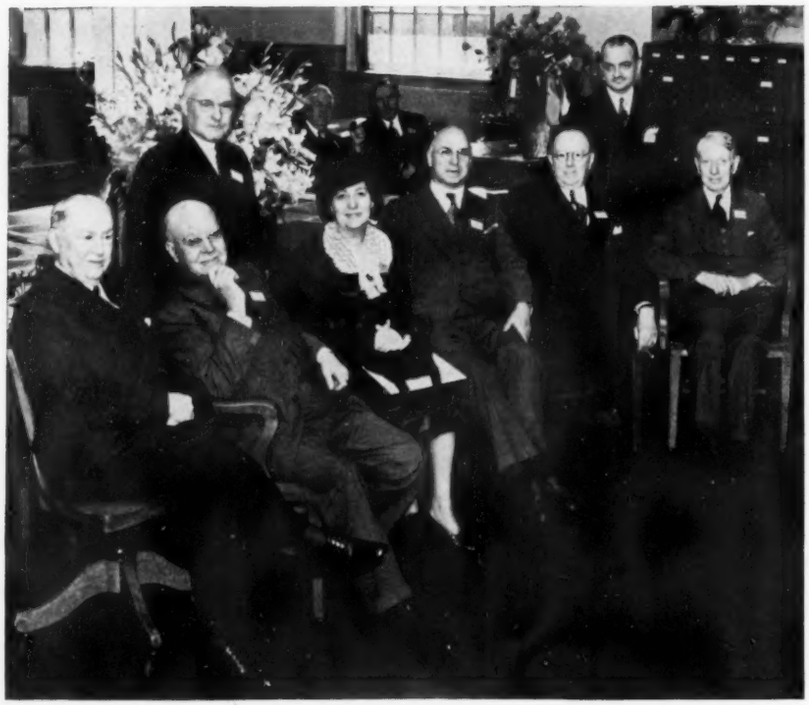
MILWAUKEE—Officers elected by the International Acetylene Association at its annual business meeting included Henry Booth, vice-president Shawinigan Products Co., president; E. L. Mills, vice-president Bastian-Blessing Co., vice-president; and Philip Kearny, president K-G Welding & Cutting Co., treasurer.

NEW I.A.A. PRESIDENT

HENRY BOOTH

MOREHEAD MEDAL WINNER

OTTO C. VOSS



Among guests *at the Gleason celebration were (left to right): E. G. Miner, Pfaudler Co.; August Tuechter, Cincinnati Bickford Tool Co.; James E. Gleason (standing); Mrs. Frida Selbert, National Machine Tool Builders' Association; Charles Bush, Charles F. Strelinger Co.; Clayton R. Burt, Pratt & Whitney Div. of Niles-Bement-Pont Co.; Joseph L. Trecker, Kearney & Trecker Corp.; and E. A. Muller, King Machine Tool Co. In the background are W. F. McCarthy, Henry Prentiss & Co.; and Tell Berna, National Machine Tool Builders' Association*

7,500 Guests Join in Gleason's Celebration Of 75th Anniversary; James E. Gleason Honored

ROCHESTER—More than 7,500 out-of-town guests and people of Rochester joined on April 6 in celebrating the seventy-fifth anniversary of the founding of the Gleason Works. Inspection of the works in the morning by 200 guests, while 1,600 employees worked at their job of building bevel gear machinery, was followed by luncheon at the Oak Hill Country Club. A dinner for out-of-town guests was given at the University Club. During the evening the plant was open to the employees, their families and friends, over 7,500 people overflowing the factory. Climax of the evening was the presentation to James E. Gleason, president of the Gleason Works, of a huge silver cup from all of his employees.

James E. Gleason, *president of the Gleason Works, was presented with a silver cup by his employees*

"I'd like to invite you all to our hundredth anniversary," said Mr. Gleason, at the luncheon. "In the next twenty-five years we will have changed the entire machinery equipment three times, and it is doubtful whether any of the present buildings will be standing. That will only be in keeping with the general average. Obsolescence and unemployment go hand in hand, and the hope of the future is in the new things. The automobile and airplane industry have led the way and have kept us busy. Due to their far-sighted methods, the machine tool industry has developed as it has."

Mason Britton, vice-chairman of the McGraw-Hill Publishing Co., said that "the American people need never fear the loss of that precious pioneering spirit which made the nation so great so long as companies like the Gleason Works maintain their vision and inventive genius." Frederick V. Geier, president Cincinnati Milling Machine Co. and first vice-president of the National Machine Tool Builders' Association, brought congratulations from his company and from the Association. Clayton R. Burt, president Pratt & Whitney Division of Niles-Bement-Pond Co., cited the contribution of the Gleason Works to the development of the automobile and to general research.

Other speakers included Tell Berna, general manager of the Builders' Association; Edward Bausch, chairman of the board of Bausch & Lomb Optical Co.; Edward G. Miner, chairman of the board of Pfaudler Co., who paid tribute to the late William Gleason, founder of the Gleason Works; A. J. Lassau, Mechanical director of Fenwick, S. A., French representatives of the Gleason Works and the man who, in 1896, sold the first Gleason machine in Europe; and Mayor Samuel B. Dicker of Rochester. E. Blakeney Gleason, vice-president and treasurer of the Gleason Works, and son of James Gleason, presided at the luncheon.

Inspecting work *in the Gleason plant are Frederick V. Geier, Cincinnati Milling Machine Co.; Mason Britton, McGraw-Hill Publishing Co.; and Charles J. Stilwell, Warner & Swasey Co.*

WATCHING WASHINGTON

Rights of craft unions as bargaining units and of employers to petition for an election likely as amendments to Wagner Act. Effect of capital-saving inventions studied by TNEC

BY BLAINE STUBBLEFIELD

WASHINGTON—Predictions are still risky, but curbstone betting here puts odds on the House to pass a bill of amendments to the Wagner Act, which will be acted upon by the Senate before this session of Congress closes.

The pro-labor House labor committee at last was forced, by popular and Congressional opinion in both political parties, to report a bill. But the committee, which is headed by Mary Norton of New Jersey, compromised only that far. Mrs. Norton announced a resolution of her committee calling upon the House to vote on the measure under suspension of the rules. That is, no amendments from the floor would be accepted, and a two-thirds vote would be required for a decision. The effect of this would be to "gag" the House. In the first place, the two-thirds vote probably could not be obtained, for or against, and secondly, Norton's plan would lay the law open to attack by anti-Wagnerians who would "give it the works" if they had the opportunity of so doing.

The rules committee will never consent to the suspension, and in all probability it cannot be ordered by House vote. Thus the voting will be done on open rules, under which amendments can be tossed in from the floor, and a majority vote is a decision. That means that not only the labor committee's four amendments will be considered, but any or all of those proposed by the Smith investigating committee. For that reason any attempt to forecast the outcome would be futile. It can be said with surety only that a majority will favor all four of the Norton amendments, and that just as certainly a majority will not favor all of the Smith amendments.

The four Norton amendments: (1) provide for recognition of craft unions as bargaining units; (2) give employers the right to petition for an election when caught in jurisdictional disputes; (3) prohibit NLRB from changing the bargaining unit for one year after the unit has been accepted and has concluded contracts; and (4) increase the membership of the present board to five instead of the three now holding office.

One of the Smith amendments would fire the board entirely and a new board of five would be appointed. This would be much more drastic than Norton's board increase proposal; President Roosevelt would be practically forced to appoint men who would throw out all personnel of importance and adopt an impartial policy.

TNEC Studies Capital-Saving Inventions

Preliminary testimony in TNEC's three-week study of technology clearly indicates that the hearings are not aimed in the directions suggested in Chairman O'Mahoney's machine-tax bill. Taking a fresh line on the subject, TNEC mastermind Theodore Kreps emphasized that only about a third of all inventions are of a labor-saving nature; about 45 per cent create new kinds of goods and generally don't tend to reduce employment.

But what was stressed before the committee was another class of capital-saving inventions—those which tend to reduce the investment required to produce a given output. For example, a $500 machine which will do the work of a former $1,000 machine. Since 1925 such inventions have begun to outstrip discoveries which tend to increase mechanization.

In addition to creating a technological unemployment of money, this has considerable relation to the employment problem. It makes questionable the common belief that labor-saving devices by stimulating mechanization will provide jobs in the capital-goods industries for the workers displaced.

A somewhat different though parallel line of thought is being emphasized by Senator O'Mahoney. He states that economies in capital and labor arising from technical progress are generally available chiefly to those commanding large blocks of capital. Moreover, testimony by Krebs and Kettering emphasized that technical innovations arise most often in research laboratories, giving an advantage to firms owning them. The monopoly issue gain was tied back to the employment question by testimony contending that labor-saving machinery creates net employment only when the savings fail to get passed along to the consumer. Since 1914, monopolistic price rigidities have resulted in only 91 men being hired for each 100 laid off; prior to that date 112 were hired for every 100 displaced.

LOANS TO THE ALLIES?

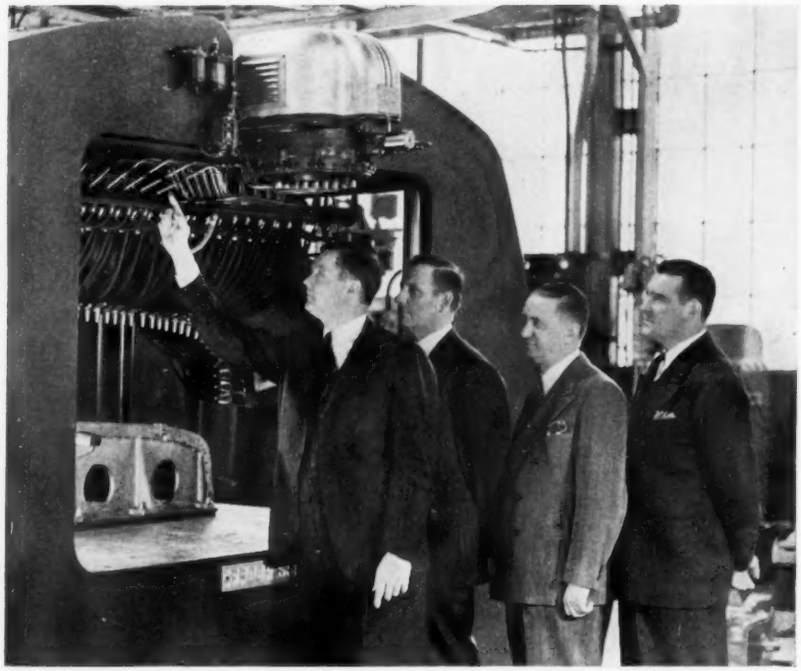
WASHINGTON—Caution on the part of the Allies in placing war orders of all kinds in the United States is said by competent observers to be the result of the necessity for conserving their cash resources. If the war lasts, as it is expected to, it is believed that the Allies will exhaust their available funds in less than two years. It seems inevitable then that some move will be made to loan them money with which to purchase goods in this country. An official close to the Administration feels that public opinion is likely to swerve strongly enough to the Allies to permit repeal of the Johnson Act within the next year.

New Trade Agreements Likely With Allies

So many smart men have argued so long on both sides of tariff that it seems like a waste of words to argue any more. Suffice to say that "Trader Hull" won his battle for extension of the reciprocal trade treaty law for another three years. Opinion here is that there will be no immediate effect of the victory. Supplemental agreements may be made with Britain, Canada and France, and perhaps some new treaties will be concluded with Latin American countries. Main advantages claimed by tariff experts are flexibility in dealing with war trade and resistance to discrimination against us by other countries. No change is in sight on machinery imports and exports.

War Materials Exporters Threatened

Belligerent gold is a powerful magnet to American copper, tin, molybdenum. These and other metals are on the Army-Navy list of strategic materials. Congress appropriated money for stockpiles of these goods. But they continued to leak out under pressure of foreign demand. The President said, some months ago, that a word to the wise should be enough. But apparently not so. Britain's move the other day to control contraband in the Pacific threw light on large exports of tin and copper. Again the administration threatens to put the squeeze on exporters. There are several easy ways to do the job.



Progressives—*Examining features of a new welder at the formal opening of Progressive Welder Company's modernistic new plant in Detroit are, from left, L. M. Benkert, newly appointed general manager; William H. Martin, secretary-treasurer; Fred Johnson, president; and T. M. Cummings, sales manager. Company, founded only five years ago, has grown from rented quarters into a well equipped 30,000-sq.ft. plant*

SALES

HARRY N. HAYES, formerly Chicago district sales manager, Coffing Hoist Co., has been named general sales manager with headquarters at the company's plant in Danville, Ill.

YALE D. HILLS, supervisor of distributors, Timken Roller Bearing Co., Canton, Ohio, has been named assistant general manager of the Service Sales Div. J. F. CORNELL, Minneapolis Sales Service Div. branch manager, has been named special representative with headquarters at Canton. He will be replaced by J. P. ROBERTS of the Pittsburgh office.

CECIL M. KNIGHTS has been appointed manager of the Detroit office of Hanson-Van Winkle-Munning Co., Matawan, N. J.

CLYDE E. LOWE has been appointed Pittsburgh district representative for Cowles Detergent Co., Cleveland, Ohio.

HAYES PARSONS, for the past several years Seattle district representative, Speeder Machinery Co., has been appointed sales manager of Link-Belt Speeder Corp., Chicago, Ill.

NAVY YARDS GET $4,500,000

WASHINGTON—Navy yard expenditures for new equipment during the fiscal year 1941, beginning next July 1, are expected to run around $4,500,000. This will compare with close to $7,000,000 to be spent in the fiscal year 1940, of which $2,000,000 will be paid from funds available in the coming year. The reduced warship building program authorized by Congress is partly responsible for lessened spending.

Fargo Awarded Large Truck Contract By War Department

WASHINGTON—Fargo Motor Corp., Division of Chrysler Corp., has been awarded a contract for trucks by the War Department costing $3,249,405. Curtiss Wright Corp. will supply propeller and blade assemblies to the Army Air Corps totaling $3,565,760 under a new contract just signed. Wright Aeronautical Corp. will furnish parts for Wright engines amounting to $318,008 to the War Department. Baldwin Locomotive Works has received an order from the Army for forgings for artillery shells and related items totaling $240,272. Clark Equipment Co. will furnish tractors valued at $179,561 to the War Department.

U. S. Government Contracts Awarded to Metal-Working Firms

(Tool Contracts on Page 260d)

Contractor	Gov't Agency	Commodity	Amount
Hardie-Tynes Mfg. Co., Birmingham, Ala.	Panama Canal	Jack bases	$119,000
Reed & Prince Mfg. Co., Worcester, Mass.	Navy	Wood screws	27,064
General Electric Co., Schenectady, N. Y.	Navy	Circuit breakers, locomotive	66,938
Reid-Avery Co., St. Helena, Md.	Navy	Welding electrodes	158,246
Hollup Corp., Chicago, Ill.	Navy	Welding electrodes	42,250
Una Welding, Inc., Cleveland, Ohio	Navy	Welding electrodes	28,890
Thos. L. Siebenthaler Mfg. Co., Kansas City, Mo.	CAA	Transmitters	59,624
Sperry Gyroscope Co., Brooklyn, N. Y.	Ordnance	Directors, cams	260,771
Northill Co., Los Angeles, Calif.	Navy	Anchors, folding	41,864
C-O-Two Fire Equipment Co., Newark, N. J.	Navy	Fire extinguishers	40,331
Worthington Pump & Machinery Corp., Holyoke, Mass.	QMC	Air compressors	27,715
Erie Steel Construction Co., Erie, Pa.	QMC	Power shovels	117,962
Northern Pump Co., Minneapolis, Minn.	Navy	Portable pumps	65,848
Machinery Builders, Inc., Long Island City, N. Y.	Navy	Towing carriage	114,812
Struthers Wells-Titusville Corp., Titusville, Pa.	Navy	Windlasses	113,124
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.	Interior, Navy, Air Corps	Electrical equipment	112,331
Jaeger Watch Co., New York, N. Y.	Navy	Aircraft clocks	62,668
Lukenweld, Inc., Coatsville, Pa.	Ordnance	Base rings	39,504
Service Machine Co., Elizabeth, N. J.	Ordnance	Machine gun parts	39,648
Chas. Fischer Spring Co., Brooklyn, N. Y.	Ordnance	Rifle parts	103,119
Bethlehem Steel Co., Bethlehem, Pa.	Navy	Gun forgings	378,425
American Brass Co., Waterbury, Conn.	Ordnance	Cartridge disks	36,297
Caterpillar Tractor Co., Peoria, Ill.	QMC	Tractors, motor graders	38,297
Bay City Shovels, Inc., Bay City, Mich.	QMC	Shovels	28,800
Pangborn Corp., Hagerstown, Md.	Navy	Blast cleaning rooms	26,546
Ideal Electric & Mfg. Co., Mansfield, Ohio	Air Corps	Primary cubicles	57,602
American Gas Accumulator Co., Elizabeth, N. J.	Air Corps	Lamp assemblies	62,310
Pennsylvania Transformer Co., Pittsburgh, Pa.	Interior	Transformers	75,386
American Automatic Electric Sales Co., Chicago, Ill.	Navy	Telephone equipment	43,187
General Electric X-Ray Corp., Chicago, Ill.	Navy	X-ray outfits	33,350
Bendix Aviation Corp., Bendix Products Div., Bendix, N. J.	Air Corps	Carburetors	84,449
Wright Aeronautical Corp., Paterson, N. J.	Coast Guard, Navy	Aircraft engines	114,318
Herman Lawson Co., San Francisco, Calif.	FSA	Power trailers	60,383
Fairchild Aviation Corp., Jamaica, N. Y.	Air Corps	Aircraft cameras	509,941
Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.	Ordnance	Data systems	428,223
Buff & Buff Mfg. Co., Boston, Mass.	Signal Corps	Instruments	39,175

NAMES in the NEWS

JOHN J. CROWE, manager of the apparatus research and development department Air Reduction Sales Co., New York, N. Y., has been appointed assistant to HERMAN VAN FLEET, vice-president and operating manager. He is succeeded by H. E. LANDIS, JR., his former assistant.

ROBERT S. CRAWFORD has been named superintendent of rolls, Timken Roller Bearing Co., Canton, Ohio.

T. R. FARLEY, assistant to the president Caterpillar Tractor Co., Peoria, Ill., and J. D. FLETCHER, export sales manager, have been elected vice-presidents.

DR. LILLIAN M. GILBRETH, president Gilbreth, Inc., and widow of FRANK BUNKER GILBRETH, with whom she pioneered in studying relationships between men and machines, has been made an honorary life member of the Engineering Woman's Club, New York, N. Y., for "scientific achievements in the field of industrial psychology and pioneer work in applying these principles to the practical problems of the efficiency of human labor."

JOHN F. HEMMERT, former supervisor Vought-Sikorsky Div. of United Aircraft Corp., Stratford, Conn., has been appointed factory superintendent. JOHN L. HARKNESS, engineer, has been appointed planning supervisor.

ROBERT F. HERRICK, JR., director Reed-Prentice Corp., Worcester, Mass., has been elected a vice-president.

DAVID E. JACKMAN, since 1911 treasurer Firth-Sterling Steel Co., McKeesport, Pa., has retired. He will continue as a director.

E. L. MORROW has been appointed road foreman of engines, Iowa Div., Chicago Great Western Railroad Co. He succeeds G. C. SPRAGG, resigned.

EDWARD S. PEROT, since early 1939 executive vice-president Crocker-Wheeler Electric Mfg. Co., has been elected president.

EDWARD J. SCHROETER, president and general manager of the Teachout Co., Cleveland, Ohio, and a director of Western Foundry Co., Chicago, Ill., has been elected president of the Huber Mfg. Co., Marion, Ohio, manufacturer of farm machinery, tractors and highway equipment.

LAWRENCE E. SCRANNAGE has been appointed general manager of the Forging Div. of Phoenix Mfg. Co., Catasauqua, Pa., in charge of sales and operations.

E. J. CHARLTON

R. L. BUNTING

G. L. SNYDER

EDWARD J. CHARLTON has been appointed general manager of Lukenweld, Inc., Coatesville, Pa., division of Lukens Steel Co. ROBERT L. BUNTING, since 1936 assistant shop superintendent, has been made superintendent, succeeding ROLAND J. WHITING, resigned. GEORGE L. SNYDER, since 1937 assistant chief engineer, has been named chief engineer. D. BRUCE JOHNSTON has been appointed manager of development and research, while ROBERT B. NIVISON has been appointed chief of inspection. Other appointments include ROBERT C. SAHLIN as assistant sales manager, S. NELSON BUELL as assistant chief engineer, FRED W. FORBES as assistant superintendent, W. J. MC ALPINE as general foreman and GEORGE WHEATLEY as methods engineer.

Mr. Charlton has been a design engineer with Lukenweld since 1931. He was born in Philadelphia in 1907, where he attended Drexel Institute of Technology. Before joining Lukenweld, he was connected with Shepard-Niles Chain & Hoist Co.

Mr. Bunting was born in Flushing, N. Y., in 1905, and attended Harvard University. Before joining Lukenweld in 1933, he was associated with Cleveland Auto Co., Reliance Electric Motors, and H. K. Ferguson Co.

Mr. Snyder was born in Rosemont, Pa., in 1912, graduating in 1935 from Drexel Institute of Technology, and joining the engineering department of Lukenweld the same year.

JOHN P. SPECK, manager of Tiffin Art Metal Co., Tiffin, Ohio, has been elected president.

WILFRED SYKES, assistant to the president Inland Steel Co., has been elected chairman of the board of Milcor Steel Co., Milwaukee, Wis. He succeeds LOUIS KUEHN, who is retiring as of April 1. E. L. LIPMAN, secretary and treasurer, has been named to the board of directors to fill the vacancy caused by Mr. Kuehn's retirement. Mr. Kuehn will continue to serve as a director of Inland Steel.

BUSINESS ITEMS

AMERICAN BRAKE SHOE & FOUNDRY CO., New York, N. Y., has purchased the Great Lakes Forge Co., Chicago, Ill.

ATLANTIC ABRASIVE CORP., 516 Pearl St., South Braintree, Mass., has been organized to manufacture grinding wheels for grinding high-speed tool steels, soft alloys, rubber and other materials which usually involve special grinding problems.

COWLES DETERGENT CO., Cleveland, Ohio, has appointed Apex Soap & Sanitary Corp., McKees Rocks, Pa., as distributor for its line of anhydrous metal cleaners.

DEAN BROS. CO., Indianapolis, Ind., pump and machinery manufacturer, has filed papers with the Indiana secretary of State changing the name to Dean Bros. Pumps, Inc., and reorganizing the corporate structure with 4,008 shares of capital stock having a par value of $100 a share.

GIEBEL MACHINE TOOL CO., New York, N. Y., has moved its Hartford office to 152 Temple St., New Haven, Conn.

GOTHAM PRESSED STEEL CORP., New York, N. Y., has moved its plant and offices to 656 E. 133rd St.

HOCKS MFG. CO. has been organized in Milwaukee, Wis., by Harry and Clyde Hocks for the manufacture of hydraulic two-speed shears.

KEMPSMITH MACHINE CO., Milwaukee, Wis., milling machine manufacturer, has appointed Atlantic Machinery Corp., 149 Broadway, New York, N. Y., as export representative and eastern distributor.

OHIO GEAR CO., Cleveland, Ohio, has appointed the Industrial Supply Co., Minneapolis, Minn., as its Northwest distributor.

Cincinnati Expands—*When completed in October, Cincinnati Milling Machine Company's foundry and welding shop will look like this. The 400 x 660-ft. brick and steel structure has been laid out to provide a continuous cycle of molding, pouring, shake-out, cleaning and painting of castings. Pattern shop will adjoin the foundry proper, while the structural steel welding and sheet metal fabrication departments will be located in one end of the new building*

PLANT EXPANSION

BETHLEHEM STEEL CO., Bethlehem, Pa., has announced plans for expansion of its Lackawanna, N. Y., bar mill facilities, which will involve erection of five new buildings about 800 ft. long, with a total floor area of nearly nine acres. Remodeling of bar mill facilities, which will involve removal and rebuilding of the old 12-in. bar mill, is expected to cost in the neighborhood of $5,000,000.

BOEING AIRCRAFT OF CANADA, LTD., Vancouver, B. C., has awarded contract to Baynes & Horie, Ltd., Vancouver, for construction of a $17,500 plant in that city. Structure will be a one-story reinforced concrete frame building measuring 100x208 ft.

DOW CHEMICAL CO., Midland, Mich., is planning construction of a $500,000 rolling mill. Structure will be of the one-story factory type measuring 300x100 ft., and will house the company's complete rolling mill equipment. In addition to present equipment now operating, a four-high rolling mill will be installed. Equipment now housed in the main plant building will be transferred to the new mill, space now occupied by present equipment to be devoted to other fabrication processes. Plant is expected to be ready for operation some time during the summer.

EMERSON ELECTRIC & MFG. CO., St. Louis, Mo., is planning to build an additional plant on a recently acquired tract of land on the outskirts of the city. The new building is planned to be a part of the proposed future transfer of all operations to the new location.

JESSOP STEEL CO., Washington, Pa., manufacturer of special and alloy steels, has completed a new building where electroplating and arc welding equipment used in production of composite steels will be installed.

GILMAN ENGINEERING WORKS, Janesville, Wis., is planning a one-story extension to its plant.

HYDRAULIC PRESS MFG. CO., Mount Gilead, Ohio, has awarded contracts for design and construction of an integrated modern plant to the Austin Co., Cleveland. Development will represent an investment of approximately $500,000 for equipment and building, which will be located on a 60-acre site recently acquired by the company in Mount Gilead. The new plant will have a total area of 50,000 sq.ft., and will be completed in August. It will be of welded steel construction, with continuous sash, high-intensity lighting, and thermostatically controlled unit heaters to insure workers' comfort.

MC KENNA METALS CO., Latrobe, Pa., has awarded a contract to Blaw-Knox Co. for construction of a new research laboratory.

STEWART MOTOR CORP., Buffalo, N. Y., has begun manufacture of a line of motor trucks. President of the new Stewart company, which has taken the name of the former Buffalo company now in liquidation, is E. E. LETZTER of the Indianapolis Machinery Supply Co.

WARNER & SWASEY CO., Cleveland, Ohio, is building a 30,000-sq.ft. extension to its plant, which will add fifteen per cent to the present capacity of the company.

WIREMOLD CO., Hartford, Conn., wiring equipment manufacturer, has begun work on a 27,000-sq.ft. plant addition. Building will provide expanded facilities for production of fluorescent lamps and accessories.

OBITUARIES

IRVING S. BILTY, 48, sales engineer in the Wisconsin and upper Michigan territory for Landis Tool Co., Waynesboro, Pa., died April 2 in a Milwaukee, Wis., hospital following an illness of several months.

D. C. JONES, 63, vice-president and general manager of the Lunkenheimer Co., Chicago, Ill., and an employee of the company since he was eighteen years of age, died March 11. He had also served as president of the American Supply & Machinery Manufacturers Association.

A. WHITON VENNEMA, 53, mechanical superintendent Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., Passaic, N. J., died March 23.

MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Annual convention, Grove Park Inn, Asheville, N. C., May 20–22.

AMERICAN IRON & STEEL INSTITUTE. Forty-ninth general meeting, Hotel Waldorf-Astoria, New York, N Y., May 23.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Hotel Bancroft, Worcester, Mass., May 1–3.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 24–28.

ASSOCIATED MACHINE TOOL DEALERS OF AMERICA. Spring convention, Claridge Hotel, Atlantic City, N. J., May 13 and 14.

CHAMBER OF COMMERCE OF THE UNITED STATES. Twenty-eighth annual meeting, Washington, D. C., April 29–May 2.

ELECTROCHEMICAL SOCIETY. Spring meeting, Wernersville, Pa., April 24–27.

MACHINE TOOL ELECTRIFICATION FORUM, East Pittsburgh, Pa., works of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., May 6–8.

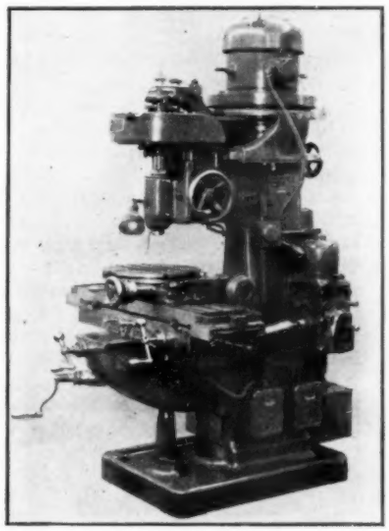
NATIONAL METAL TRADES ASSOCIATION. Forty-second annual convention, Biltmore Hotel, New York, N. Y., May 21 and 22.

SOCIETY OF AUTOMOTIVE ENGINEERS. National production meeting, Hartford, Conn., May 6 and 7. Summer meeting, The Greenbrier, White Sulphur Springs, W. Va., June 9–14.

SHOP EQUIPMENT NEWS

Reed-Prentice Vertical Miller and Die Sinker Now Features Back-Gear Spindle Construction

The No. 3VG vertical miller and die sinker, which supersedes the present No. 3V machine, is offered by Reed-Prentice Corp., Worcester, Mass., for a wide range of toolroom operations. Featuring back gear spindle construction, this No. 3VG machine provides slower spindle speeds than can be secured with direct belt drive. Using a 1200 r.p.m. spindle drive motor, vertically mounted above the column, spindle speeds with back



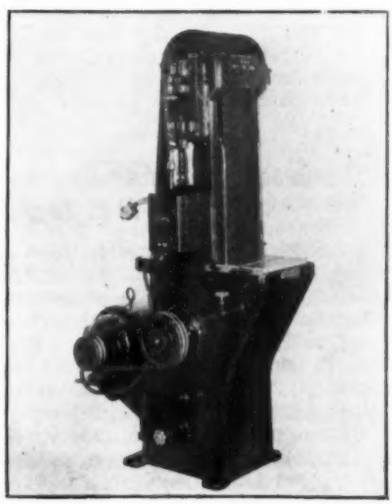
gear range from 135 to 320 r.p.m., while open-belt speeds range from 400 to 2,600 r.p.m. Except for the back geared spindle, the No. 3VG machine has the same dimensions and capacities as the No. 3V miller.

Drive to the spindle is through a V-belt from a 3 hp. ball bearing vertical motor. Spindle and motor pulleys are four step, providing by direct drive, and crossing belt to adjacent steps of motor and spindle pulleys, ten spindle speeds with a constant speed motor. Spindle is carried in ball bearings. All rotating parts are balanced to insure operation without vibration. The sliding head is operated by a handwheel to provide accurate setting of the cutter. Micrometer stop is furnished for feeding the head accurately to depth. Eighteen changes of feed range from ½ to 20½ in. per min. The rotary table available for this machine has a working surface of 16½ in. diameter, with hand and power feeds in either direction. Table is graduated to 360 deg. and is supplied with adjustable vernier dials on the handwheel shaft. A micrometer table setting attachment is available for use where costs and longitudinal movement of the table must be set accurately.

Specifications: Longitudinal power feed, 24 in.; cross feed to table, 12 in.; vertical adjustment of knee, 18 in.; vertical adjustment of head on column, 5 in.; maximum distance from spindle to table, 18 in.; maximum distance from spindle to rotary table, 13½ in.; maximum distance from spindle to column, 16 in.; working surface of table, 10¼x36 in.; taper hole in spindle, No. 10 B. & S.; floor space required, 57x70 in.; height of machine, 80 in.

Porter-Cable Wet-Dry Sander Has Variable-Speed Drive

Model G-8 wet-dry belt sander-grinder developed by Porter-Cable Machine Co., Syracuse, N. Y., provides speeds from 2,400 to 6,000 ft. per min. for grinding metals, plastics, ceramics, glass, rubber and similar materials. It is used for squaring, cleaning, burring, facing, polishing, and for removing gates and flash from castings. The long belt, 9 ft. in circumference, reduces heat and is said to give more economical service. It is said that wet grinding does not permit the belt to load up. The grit is clean and free to cut to its full capacity at all times. Finer results are claimed with any grit, for instance, working with a No. 80 belt, the finish is comparable to No. 120 grit used dry.



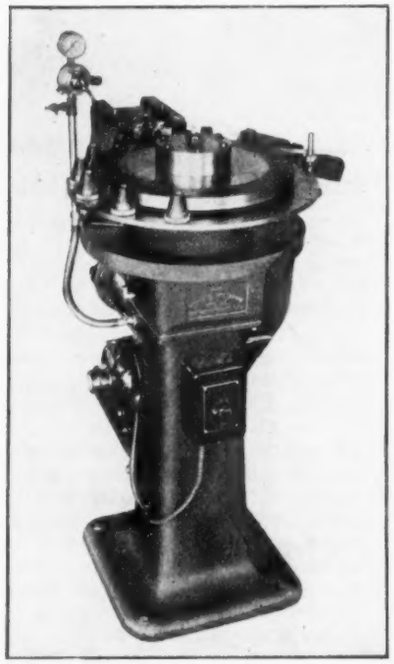
Watson-Stillman Automatic Molder Used for Thermosetting Materials

This 50-ton automatic compression molding machine developed by the Watson-Stillman Co., Roselle, N. J., is of the fully-automatic hydraulic compression type and has been designed for molding thermosetting materials, as well as thermo-plastics. Over-all measurements are: length, 106 in.; width, 33½ in.; height, 116 in. Die plates measure 10 in. from top to bottom, 18 in. from front to back, and 10 in. from right to left. Maximum vertical opening is 23 in. and horizontal opening between plates is 22 in.

The machine consists essentially of one vertical and one horizontal cylinder, a hydraulic power unit, and a feed and ejector mechanism auto-

matically operated and timed to function in proper sequence. Vertical and horizontal pistons are 11 in. in diameter, and stroke of vertical and horizontal rams is 12 in. Full-automatic control applies to all the successive operations, from the feeding of loose granular or preformed material into the hopper, to the final ejection of molded parts and compressed air-cleaning of dies. The molding cycle is repeated automatically over an indefinite period with no manual operation. Control over predetermined quantities of feed, timing and ejection is said to be pos-

itive and is safeguarded by special controls. Flash, semi-positive, positive, or split types of dies may be used. Dies can be mounted so that they move out of line while the molded pieces are being ejected. Steam-heated die plates are supplied as standard equipment; electrically-heated plates also are available.



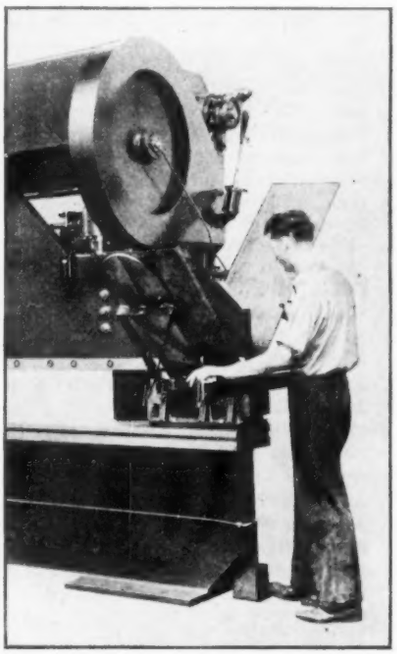
Noble & Westbrook Marker Holds 6-in. Diameter Pieces

Work pieces up to 6 in. diameter can be held on the No. 98 rapid precision marking machine developed by the Noble & Westbrook Mfg. Co., 20 Westbrook, East Hartford, Conn., by using pressure dials of the proper size. This machine was designed for marking permanent inscriptions on work pieces that can be placed on end, such as bushings, socket wrenches, spark plug shells, small explosive shells, and similar articles. When using this machine the work pieces should have sufficient wall thickness to withstand the marking pressure.

Both the pressure dial and the die holder have vertical adjustment so that the inscription can be marked on the piece up to approximately 1¼ in. from the end. The die holder has a lateral adjustment for various sizes of work pieces, using the same pressure dial. An automatic unloading device is provided for ejecting the work pieces after the marking operation. Pneumatic pressure can be adjusted to suit the requirements of the work and permits uniform depth of inscriptions on work pieces varying ¼ in. or more in diameter, or on work pieces slightly out of round. The machine requires a 30x20 in. floor space and weighs 800 lb.

Fixtures Hold Material In "Sturdybender" Brake

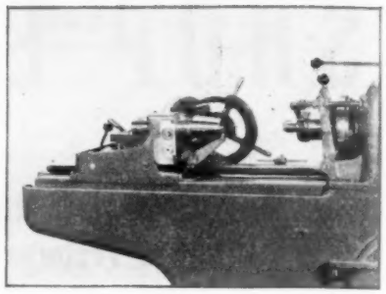
Reverse bends, frequently caused by a whip in the sheet and due to the difficulty of supporting the metal during the action of the press, are eliminated through the use of special fixtures mounted at each end of this Sturdybender press brake arranged for forming large metal boxes of light gage material by Cyril Bath & Co., East 70th St. and Machinery Ave., Cleveland, Ohio. The fixture supports the metal during the process of bending, the gaging being done from holes already punched in the sheet for other purposes. The die is of the triple-action type and the flanges are taken around the corner smoothly by special spring die arrangement. The raising or supporting arms prevent reverse bends and put the operation



on a production basis. The work is done on a press brake with overhung bed and ram on each end, so that two operators finish a completed box ready for the back to be welded at better than 80 pieces an hour.

"Landmaco" Threading Machine Adapted for Shell Tapping

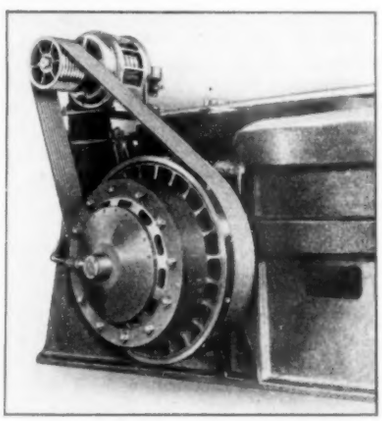
Although designed primarily for cutting external threads, the "Landmaco" threading machine made by Landis Machine Co., Waynesboro, Pa., is shown here fitted with a Style ALT collapsible tap to permit the cutting of internal threads on the fuze plug end of shells. Shown set up for tapping 75 mm. shells, the machine will tap a number of sizes. In addition to substituting the collapsible tap for the usual "Lanco" head, special accessories for this arrangement include a gage arm, special round grips and a work-supporting cradle.



The gage arm protrudes beyond the carriage front and provides a definite stop against which the work is located before it is clamped into the carriage front. It is important that the work be located accurately, since the tapped thread bottoms against a shoulder. Furthermore, the over-all thread length must be held within very close limits. The round grips are employed to assure correct alignment of the work with the center of rotation of the tap. They are ground to conform to the diameter of the work. Since the carriage front incorporates vertical and horizontal adjustments, the grips readily can be indicated and adjusted until they are in alignment to assure a high degree of thread concentricity. The work supporting cradle is located on the carriage directly back of the carriage front. This cradle also is ground to conform to the diameter of the work, and is located on the carriage in alignment with the center of rotation of the tap.

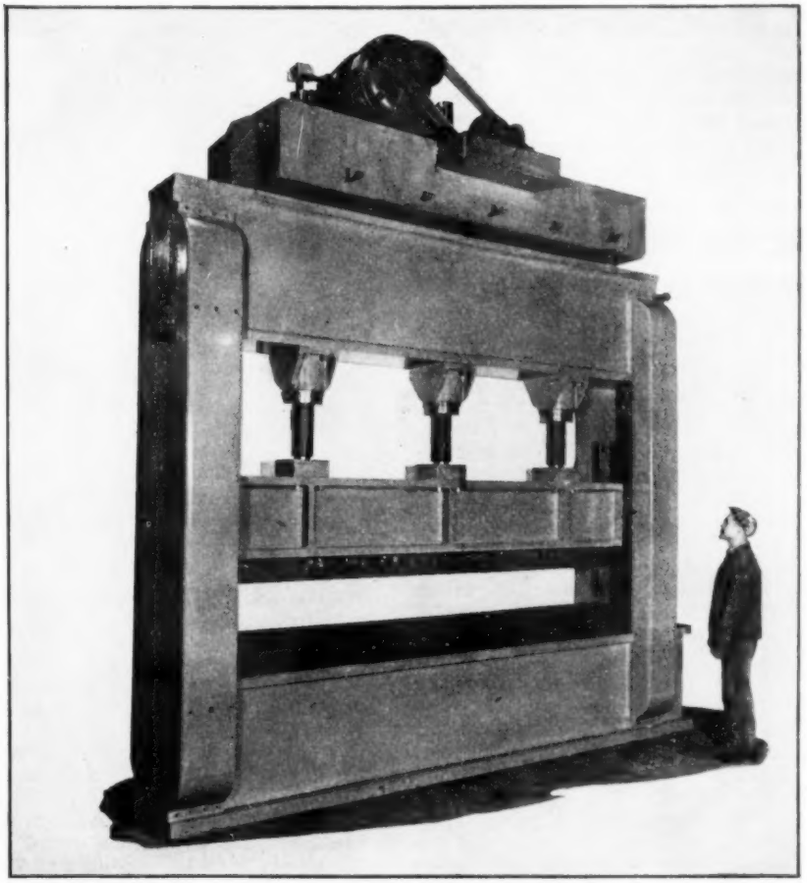
Air-Cooled Clutch Offered By National Machinery

A line of heavy-duty air-cooled friction clutches has been developed by the National Machinery Co., Tiffin, Ohio, especially for high-duty forging machines, Maxipresses and other applications. The leather gasket on the operating position of these clutches



can be replaced by merely removing the piston head. All of the driving and driven plates and the driving pinions can be removed for inspection or repair without removing the flywheel or disturbing the adjustment of either of its bearings. Even though the clutch plates are of large size, the centralized location of the operating piston insures an equalized pressure over the clutch faces, so that a maximum of torque is obtained. The plates float to position in closing so that uniformity of operating pressure is maintained and clutch surface life is improved. Fan cooling system has been so arranged that even though a large quantity of air is passed over the clutch, none of the air can circulate between the plates. Thus, shop dirt is prevented from being carried on to the clutch surfaces. The design is such that grease from the bearings cannot find its way onto the clutch surfaces, so that trouble from glazing and slipping is eliminated.

Welded Steel Construction Featured in "Bull Press" Offered by Contract Engineering



The "Bull Press" unit for bending, forming, straightening, horning and similar operations is offered by Contract Engineering Corp., Cleveland, Ohio, in any capacity to meet requirements for the production of welded steel fabricated equipment. The press shown has capacity for bending a 10 ft. length of ½-in. mild steel plate, having an ultimate strength of 60,000 lb. per sq. in., to an angle of 90 deg. on a 6 in. V-die block. The beams and columns have a nominal strength of 400 tons. Power is supplied by a 25 hp., 3-phase, 60-cycle, hoist-type motor made by the Lincoln Electric Co. This motor is equipped with an extended shaft for a brake. Power is applied through a standard V-belt drive to a countershaft which drives a spur-gear train to move the screws. Motor has two speeds, permitting the movement of the ram in either direction at 16 or 8 in. per min.

Beams, columns, ram and base of this press are hollow sections fabricated of steel plate. The shallow depth of the machine facilitates handling of plates during bending, and also provides a piece of equipment requiring a minimum of floor space. In addition to being used in building the machine structure itself, arc welded steel construction was employed in fabricating the drive gears. High carbon steel was used for face rings. Pinions are flame-hardened.

"Clarkat" Industrial Tractor Pulls 25 Tons on Trailers

Streamlined and steel turreted to afford complete driver protection, the "Clarkat" industrial tractor offered by Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich., will pull 25 tons on trailers. The ma-

chine is of compact design so that it can be used in crowded aisles or on congested platforms. Twin wheels at the front provide stability and assist the tractor in negotiating rough roadways. Power is provided by a Continental "Red Seal" gasoline motor. The tractor has an over-all width of 38¼ in., a 57 in. turning radius, a speed of 8 m.p.h., and is equipped with a self starter and hydraulic brakes. A heavier model, which will pull 40 tons on trailers, also is available.

Improved Ozalid Whiteprinter Uses Mercury Vapor Lamp

The improved Model A automatic high speed whiteprint machine made by Ozalid Corp., 354 Fourth Ave., New York, N. Y., employs a quartz envelope high pressure mercury vapor lamp which provides a fast printing speed, ranging up to 20 linear feet per minute, and assures uniform distribution of light over the entire printing surface. This printer is available in two

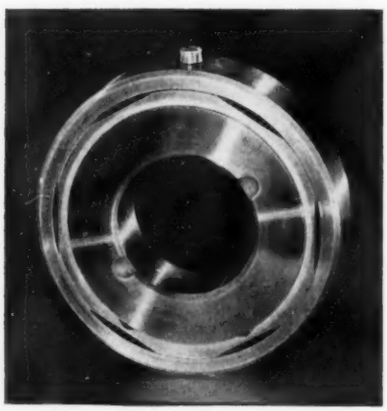
sizes for prints up to and including 42 and 54 in. widths. Each machine incorporates a device which automatically separates the print from the original after exposure. The original is returned to the operator at the front of the machine, while the exposed print automatically is conveyed to the developing unit where, after dry development, it is discharged at the rear of the machine ready for use.

"Porto-Rect" Rectifiers Made for Industrial Use

A line of "Porto-Rect" a.c. to d.c. portable power rectifiers for industrial use is offered by Cassels Engineering & Machine Co., P. O. Box 114, Wauwatosa, Wis. The unit shown is of a special design, and has a six-step voltage tap switch, a voltmeter and an ammeter. Single-purpose units generally are not so equipped. The units require no special wiring

and will furnish d.c. power from any a.c. outlet. Their principal field of use is in the operation of magnetic devices and in providing adjustable speed controls for d.c. motors. They are available in sizes from 12 to 200 amp. output at any standard voltage.

Fast's Multiple Oil Film Bearing Now Being Manufactured by Bartlett Hayward



Three principal component parts, an outer sleeve, an inner sleeve, and a journal hub, comprise the fast multiple oil film radial bearing. Location bearings usually are provided at each end of the unit

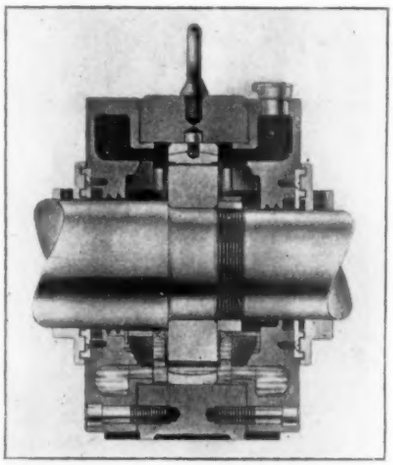
Fast's multiple oil film bearing, for which United States rights were obtained last summer from Gustave Fast by Bartlett Hayward Div., Koppers Co., Baltimore, Md., carries the load on a plurality of perfect wedge-shaped oil films which prevent metallic contact and wear, and eliminate vibration and noise. It employs the hydrodynamic theory of lubrication, based upon Newton's law of viscous resistance of liquids.

The load-bearing wedge-shaped oil films automatically are maintained over the full bearing surface, since each bearing is so designed that it acts as a centrifugal viscous feed pump, drawing the oil from the bearing housing reservoir and distributing it throughout the bearing. A surplus of oil is circulated and acts as a cooling medium, eliminating high local temperatures in the oil film. It is stated that these bearings, in a sealed housing, will run continuously for a year on a single filling of oil. Load capacity is said to increase with speed and normally is as great as that of the shaft. The bearings also are said to provide high operating economy because of their long life, minimum depreciation and low oil consumption.

Fast's multiple oil film bearing comprises three component parts. The outer sleeve has an outer diameter suitable for a sliding fit in the bearing housing, and a concave spherical bore. The outer boundary of the inner sleeve is polygonal in general form, but the corners of the polygon are machined to convex spherical contours to fit the spherical bore of the outer sleeve. The outer boundaries of the inner sleeves for some of the larger bearings vary somewhat from the general polygonal form, but their functional characteristics remain unchanegd. The bores of all inner sleeves are cylindrical.

Journal hub is cylindrical in form and has a straight bore for a shrink fit on its shaft. A locating pin on the outer sleeve engages a pole or slot in the housing bore and thus restrains any tendency of the outer sleeve to rotate. This same locating pin projects through the spherical bore of the outer sleeve, acting as a stop to prevent actual rotation of the inner sleeve, but permitting sufficient swiveling of the inner sleeve for alignment purposes.

The inner sleeve and journal hub together incorporate a reliable oil distribution system. The rotating hub which dips below the oil surface in the lubricant reservoir acts as a viscous pump rotor and draws oil up from the reservoir through a plurality of supply ducts, which terminate in the two lower transverse grooves, in the inner sleeve. This and similar transverse oil grooves equally spaced around the bore all communicate at each end with circumferential oil distributing ducts. Rotation of the journal hub forces oil under adequate pressure across the full width of its own bearing surface and in direct contact therewith through the transverse oil grooves spaced around its periphery. The adherence



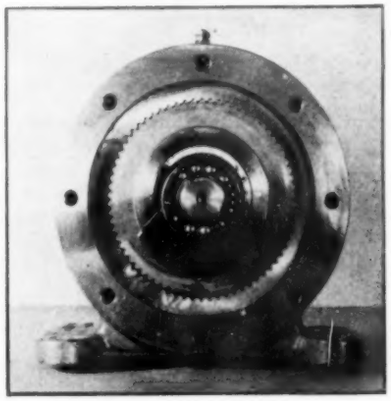
This cross section view of a Fast bearing housing shows radial and location bearings in place

of this oil to the rotating outer surface of the hub causes it to be dragged in between the bearing surfaces of the hub and inner sleeve in sufficient quantity for the establishment of the required oil films. Design of the inner sleeve permits the formation of oil film wedges of the proper form for any giving loading. The inner sleeve deflects between its spherical supporting contacts with the outer sleeve, as a result of internal pressure. The section moduli of the deflecting elements are so proportioned that a given bearing will produce an angular deflection requisite for the most efficeint oil film wedge form for that load.

Brad Foote Speed Reducers Provide High-Ratio Reductions

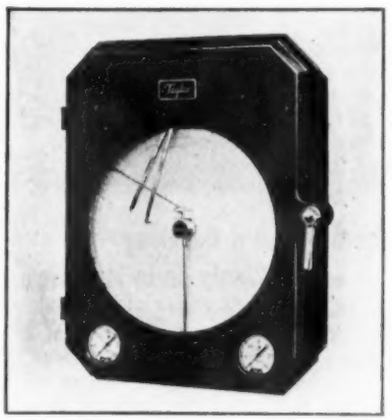
The Brad Foote Gear Works, 1301 S. Cicero Ave., Chicago, Ill., have developed a compact speed reducer which develops high ratio reductions without the use of large gears or drives. A double spur or combination

spur and internal gear, ball bearing mounted on a drive shaft eccentric, meshes with a stationary internal gear. In mesh with the secondary gear is either a spur or internal gear which is solid and is concentric with the output shaft. Eccentric drives initial spur around the pitch line of the stationary internal gear. To obtain large ratios, a small difference in number of teeth between spur gear and internal gear is used. This makes the pitch line of the spur almost conform to that of the internal gear. Thus a large number of teeth are engaged, increasing the load-carrying factor. A handbook showing sizes, ratings and ratios is available.



"Fulscope" Controllers Feature Ease of Operation

Taylor Instrument Cos., Rochester, N. Y., have introduced a completely redesigned line of "Fulscope" air-operated recording and indicating controllers for temperature, pressure, rate of flow and liquid level. In addition to the convenience of combining in one instrument the conventional proportional response and automatic reset forms of control, these instruments introduce a third process-control effect, "Pre-Act." This is a supplementary control feature which makes control-valve corrections according to the rate of control-point deviation. In response to sudden disturbances in the process or variations in the controlling medium, over-peaking or oscillating is reduced by an immediate and relatively larger control valve action than would occur otherwise. Furthermore, this feature stabilizes operation after a change in set point and when equipment is started up.



"Stryco" Bandsaw Welder Is Entirely Inclosed

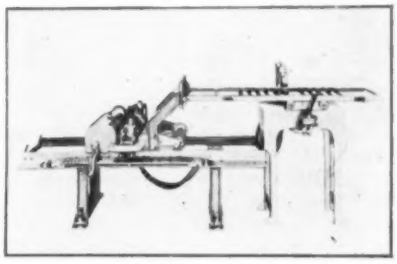
The "Stryco" bandsaw flash welder developed by Stone-Ryals Electric & Mfg. Co., 470 Natoma St., San Francisco, Calif., is entirely inclosed to prevent flying particles of steel from the flash, and other foreign substances, from getting into the moving parts. Alignment of the jaws is assured by a convenient adjustment to compensate for any wearing of the welding surfaces. These Type M. F. welders incorporate complete automatic action and control. It is necessary only to clamp the saw band ends in the jaws and press a button, which operates a built-in motor drive. This automatically operates a moveable jaw and insures accurate speed and timing in the completion of the welding. A convenient dial provides adjustment for various saw sizes throughout the range of the welder. After the weld is completed, the jaws are moved apart and the saw reclamped; then by pressing the annealing button, the steel is normalized at the welded point to assure proper strength and allow for dressing off surplus material. The No. N.F.4 unit shown is rated at 4 kw. and has capacity for 1 in. saw blades. A larger unit, the No. M.F.6 is rated at 6 kw. and will take 2-in. blades.

Shaw-Box Electric Hoists Used in Limited Spaces

"Load Lifter Jr." heavy-duty, low-headroom electric hoists offered by Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., Muskegon, Mich., now are available in sizes of 500 and 1,000 lb. lifting capacity. These hoists are of the wire rope and drum type. On both sizes the hook in its highest position comes within 12¼ in. of the bottom of the beam on which it travels. They are available in lug suspension for bolting in place, hook suspension for hanging in place, and combined with a push-type ball bearing trolley for operating on either I-beams or special monorail track sections.

Pollasky Automatic Feeder Handles Blanks of Any Size

Featuring a pneumatically operated automatic carriage, the automatic press feeder developed by A. R. Pollasky, 3918 N. 23rd St., Milwaukee, Wis., can be used in connection with any size or style of press, mechanical or hydraulic. Blanks are placed in position while the press is operating, and the operator's hands are kept out of the danger zone. Fast automatic operations on forward and return strokes allows continuous feeding of blanks. Any size of blanks can be handled, the inexpensive blank holders being designed to suit the die and blank. Blanks are supported by springs placed to suit the forming operations. The finished formed piece is ejected from the die by the blank holders as they advance to position the next piece.

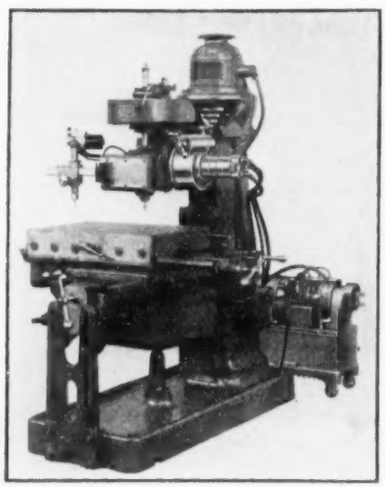


Pins placed in front and rear spacing bars control the carriage. As the carriage contacts the pin, the air cushion locks the carriage to the table with no rebound. Carriage release is actuated by the press slide, thus can be timed on either the down stroke or the upstroke. Operating

speed of carriage is about 100 ft. per min. and rate of production is dependent upon operator's ability to place blanks.

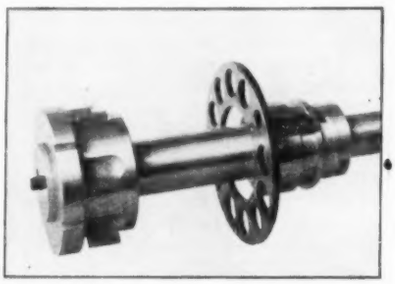
Detroit Universal Duplicator Provides Sensitive Control

Greater accuracy and faster production in the duplicating of dies, molds, and similar parts, are claimed for an improved duplicating control and drive mechanism announced by Detroit Universal Duplicator Co., 249 St. Aubin St., Detroit, Mich. The sensitivity of control necessary for such work is provided through an auxiliary drive and an improved type duplicator, including a "superimposed" impulse mechanism. With this design the duplicator can be used either to actuate the table feed or, through the auxiliary control, the head feed of vertical milling machines. By developing the head feed control as an independent unit, the usefulness of the duplicator proper as a universal unit interchangeably applicable to a wide variety of machine tools such



as lathes, shapers, planers, and boring mills, is retained. The duplicating control, in addition, is so designed that it does not interfere with the use of a milling machine when duplicating control is not required.

The new drive, which mounts on the milling machine head and actuates the vertical feed, consists of an hydraulic motor mounted on the milling machine head to which is connected the down feed through a 300 to 1 reduction gearing. Two flexible hydraulic cables supply fluid from the duplicator unit for operation. A hand crank provides for manual movement of the head down feed when setting up work. Feed control is broken down into extremely small steps, permitting working accuracies as high as 0.0015 in. on most types of work. As the tracer follows the pattern or templet, a series of electrical contacts is made, each immediately broken by a cam-operated contact point. Each time contact is made, one of two solenoids is actuated, these in turn controlling the up or down position of an hydraulic valve plunger. The change in position of the plunger diverts fluid under pressure from the hydraulic pump into either of two flexible hydraulic supply lines connected with the hydraulic feed motor of the drive. Even when the tracer is following a section of the pattern requiring no feed, electrical contacts continue. However, these impulses are of such short duration and in such rapid sequence that they neutralize each other and no motion is transmitted to the machine tool.

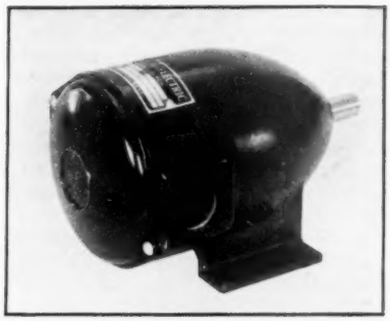


Lengthened Geometric Tap Equipped With Roller Pilots

Developed especially for deep hole tapping in large castings, this special 8-in. Class S collapsing tap made by the Geometric Tool Co., New Haven, Conn., will tap diameters from 8½ to 10 in., 8 threads per inch. This is a lengthened tap equipped with roller pilots. Included in the features of this tap is a special adjusting ring which makes possible the employment of roughing and finishing cuts with the one tool.

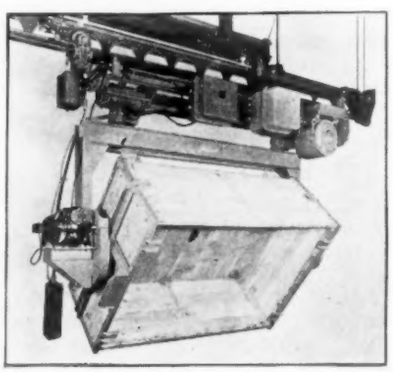
G.E. Plugging Switch Controls Motor Stopping

The use of an Alnico magnet in a plugging switch for controlling motor stopping eliminates frictional parts or clutches and is claimed to contribute to low maintenance costs and long operating life. Introduced by the General Electric Co., Schenectady, N. Y., this compact switch has low operating torque and is immune to heat. In the operation of this switch, a driven Alnico rotor produces a rotating magnetic field which induces eddy currents in the walls of an aluminum cup. The magnetic reaction turns the cup and contacts are operated by a Textolite rod, which connects the cup and the movable contact strip. Centering springs tend to keep the contacts in the normal position, but since the magnetic operating force on the aluminum cup is dependent on speed, contacts operate at and above a definite speed. As the speed decreases, a point will be reached where spring force overcomes the magnetic force. This is the tripping point. Changing the spring tension provides a simple means of adjusting the tripping speed over a definite range.



Cleveland Box Grab Unit Rotates Box 360 Degrees

The Cleveland Tramrail Div., Cleveland Crane & Engineering Co., Wickliffe, Ohio, has developed a full-rotation box grab and tramrail carrier suitable for conveying material in a wide range of industries. Boxes may be turned to any position by means of a gear-motor drive. If desired, a complete turn may be made. A twin hoisting unit is used to raise or lower the box, which is securely clamped by means of hand wheel located at one end of the mechan-



ism. The unit shown is for boxes 48 in. wide, 72 in. long, and 30 in. deep, and will carry 2,000 lb. of material. It has a full-load hoisting speed of 20 ft. per min., and a travel speed of 150 ft. per min. A pushbutton control station is used for all operations, including turning.

Rogers Model H Cushion Used Singly or in Multiples

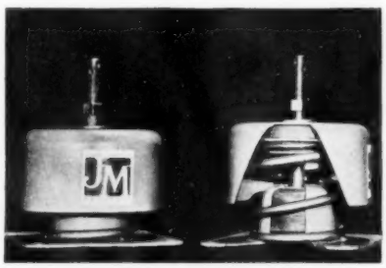
The Dayton Rogers Mfg. Co., 2830 S. 13th Ave., Minneapolis, Minn., has announced development of the Model H pneumatic die cushion, which is made in four sizes. This general util-

ity telescoping die cushion is adapted for all press applications, including inclinables and straight sided presses. It may be used singly or in multiples. Multiples are used in two, four and six units, and mounting plates are made to fit the given press requirements. Two cylinders and two pistons

are provided with each unit. These telescoping cylinders make it possible to mount the cushion without a pit. When the cushions are not needed, as for blanking and piercing work, and when the cushion is not under air pressure, the cylinder may be bled, allowing the pin plate to drop down, thus permitting blanks and pierced slugs to drop through the free opening in the bolster plate.

Machine-Vibration Isolators Announced by Johns-Manville

Designed economically to control machine vibration and reduce the resulting noise, the J-M controlled-spring isolators developed by Johns-Manville, 22 E. 40th St., New York, N. Y., are used in the bases of motors, generators, pumps, ventilating fans and similar equipment where vibration and excessive motion creates noise, wear out machine parts and damage connections, as well as crack supporting walls and floors.



The working parts of the unit consist of a coil spring and a rubber load pad, which support the equipment and isolate vibration, and an adjustable rubber snubber inside the base, which controls excessive motion. The isolator will take care of horizontal and torsional, as well as vertical vibration. It is made in two sizes: light-duty, for loads from 60 to 90 lb. per isolator; and heavy-duty, for loads from 250 to 720 lb. per isolator. Heavy machines may be isolated by clusters of the unit.

New Jackson Eyeshield Fits Face Comfortably

Developed by Jackson Electrode Holder Co., Detroit, Mich., the eyeshield shown is characterized by its lightness, comfort and wide vision. It is recommended particularly for workmen engaged in buffing, polishing, light grinding and woodworking operations, and for helpers around

spot, flash and gun welding machines. The shield fits the face snugly and comfortably, provides complete eye protection, does not interfere with prescription glasses. Lenses of flexible, shatter-proof Plastacele provide wide vision in all directions. Ventilation is provided through screened grommets.

Lufkin "Chrome Face" Tape Has Easy-to-Read Markings

"Chrome Face" is the name of a line of steel measuring tapes recently placed on the market by the Lufkin Rule Co., Saginaw, Mich. These accurate chrome plated steel tapes have jet black markings which stand out in sharp contrast with the chrome-white surface. They are offered in ⅝ and ½ in. widths in leather cases, and ⅜ in. width in imitation leather cases. Also available are ⅜ and ½ in. tapes on metal frames with plumb bobs for tank gaging.

Automatic Electric Glue Pots Offered by Westinghouse

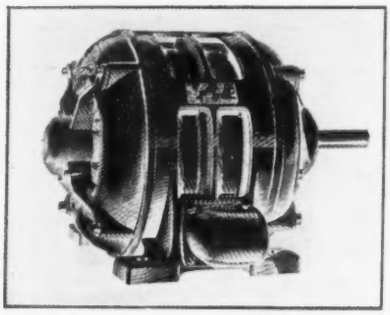
An automatic, dry-type electric glue pot featuring a snap-action thermostat which maintains a temperature of between 150 and 160 F., the most efficient temperature for keeping glue at working consistency, is announced by Westinghouse Electric & Mfg. Co., Mansfield, Ohio. Only 30 to 50 min. is required to heat a full 2 qt. container to 150 F., the time being determined by the type of glue used. The removable glue container is approximately 7⅜ in. in diameter and 9 in. high; made of nickel copper, it will hold heat and yet withstand hard service under constant use. These units have a rating of 250 watts and operate at either 115 or 230 volts.

Norma-Hoffman Small Bearings Now Available with Retainers

Norma-Hoffmann Bearings Corp., Stamford, Conn., has announced that its small sizes, which have heretofore been available in the full (retainerless) type, can now be obtained as standard with retainers (or ball cages). The five standard diminutive precision ball bearings covered by this announcement have the following dimensions: ⅛ in. bore, ⅜ in. outside diameter, $\frac{5}{32}$ in. width; $\frac{1}{16}$ in. bore, ½ in. outside diameter, $\frac{5}{32}$ in. width; and three models with ¼ in. bore, ⅝ in. outside diameter, 0.196 in. width. The ¼ in. bore bearings are available without side plates, with single side plates, and with two side plates. A data sheet covering these small bearings is available.

"Lo-Amp" Electric Motor Has No Brushes or Relays

Supplied with either high starting torque or normal starting torque, the "LO-AMP" electric motor announced by the Louis Allis Co., 133 E. Stewart St., Milwaukee, Wis., has low locked rotor current. Claimed to have all of the the rugged simplicity of a stand-



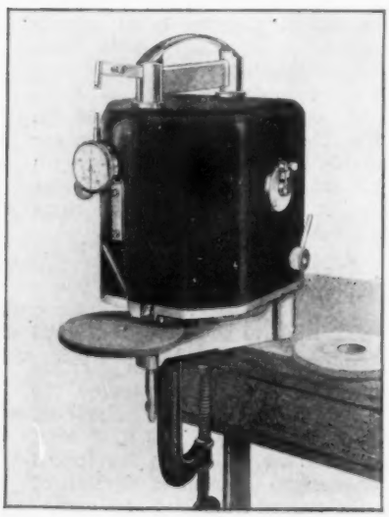
ard squirrel cage motor, this motor does not have any centrifugal switches, relays, brushes or slip rings. Multi-step starters and similar control equipment are not required for this motor.

Cutler-Hammer Motor Starter Includes Disconnect Switch

Savings in wall space, installation time and wiring costs are claimed for the combination across-the-line starter and motor disconnect switch, Bulletin No. 9589, offered by Cutler-Hammer, Inc., 205 N. 12th St., Milwaukee, Wis. Overload protection is provided by a thermal relay which permits working the motor up to the maximum limit safely, yet provides positive protection. Overload heater coils and operating coils are rapidly interchangeable. The mechanical door interlock prevents opening the door when the disconnect switch is closed. This starter is available with either three or four poles, in five sizes, with horsepower ratings from 6½ to 200 hp., and with a number of types of cover control.

Abrasive Engineering Offers Portable "Grade-O-Meter"

The portable Type P "Grade-O-Meter" developed by Abrasive Engineering Corp., 15947 Turner Ave., Detroit, Mich., has been developed especially for the use of grinding wheel users for accurately grading grinding wheels of practically any size. Based on the same principles as larger "Grade-O-Meters" and calibrated so as to give corresponding readings, this portable unit weighs 28 lb. and can be clamped to any work bench.



Paragon Reset Timers Control Industrial Operations

An almost unlimited number of industrial operations can be precisely controlled by the "Paragon" series of automatic reset timers and time delay relays made by Paragon Electric Co., 37 W. Van Buren St., Chicago, Ill. These instruments can be used for a number of purposes. Among these are: (1) to close and then reopen a circuit; (2) to open

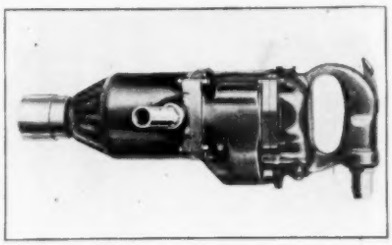
and then reclose a circuit; (3) to make a momentary contact; (4) to repeat a preset schedule of momentary contacts or timed on and off operations; (5) to reset instantaneously after a power failure. They are furnished with eight terminals.

Westinghouse Heaters Available in Two Types

Two improved types of oil immersion heaters designed specifically for heating mineral oil, paraffin and alkaline cleaning solutions, are offered by Westinghouse Electric & Mfg. Co., Mansfield, Ohio. The terminal boxes on these oil heaters have been changed to conduit boxes which simplifies the wiring problem. The non-circulating heater is designed for tanks or oil baths requiring little or no circulation. Heating tubes range from 14 to 37 in. in length with a rating of from 1 to 3 kw. Heater tubes on the circulating type heater range from 32½ to 37 in. in length with a rating of from 5 to 8 kw. This heater is designed for applications where the oil circulates at a sufficient rate to absorb the heat and prevent excess heater tube temperatures.

Chicago Reversible Wrenches Use "Power Vane" Rotary Motor

Nos. 365-R and 375-R reversible power wrenches offered by Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., employ "Power Vane" slow-speed rotary pneumatic motors. These wrenches have no gears or resilient member in the driving units. Light in weight and having a short over-all length, they are easy to handle. The No. 365-R wrench has capacity for 1½ in. bolts, is 16¼ in.



long and weighs 27½ lb. The No. 375-R wrench weighs 61 lb., is 21¼ in. long, and can be used for either applying or removing nuts up to and including 1¾ in. bolt size.

Metcolizing Process Protects Metal Exposed to Heat

"Metcolizing" is a process developed by Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City, N. Y., for protecting iron and steel, and in some cases copper and bronze, against oxidation and scaling at elevated temperatures. It also is recommended for the protection of nickel and nickel-chrome alloys against attack by sulphurous gases. The Mecolizing process includes (1) the application of a coating of Metco H.P. aluminum to a specific thickness by the metallizing process, (2) the application over the coating of aluminum of a coating of "Metcoseal" liquid, and (3) the heat-treatment of the article thus coated to cause the aluminum to alloy with the base metal. When the article is placed in service under heat the aluminum continues to oxidize on the surface and to diffuse into the iron or steel, the speed of oxidation and diffusion being dependent upon the degree of heat. At temperatures above 1,472 F. the oxidation is rapid and the aluminum layer soon disappears, leaving the residual solid solution layer which provides the protection to the coated article at high temperatures. This compound coating is claimed to be strongly adherent, highly resistant to scaling, and to withstand abrasion to a high degree. As long as the aluminum-rich coating remains on the surface, scaling is impossible, and it is only when the article is heated to a temperature above 1,832 F. that the accelerated diffusion of the aluminum into the base metal lowers the

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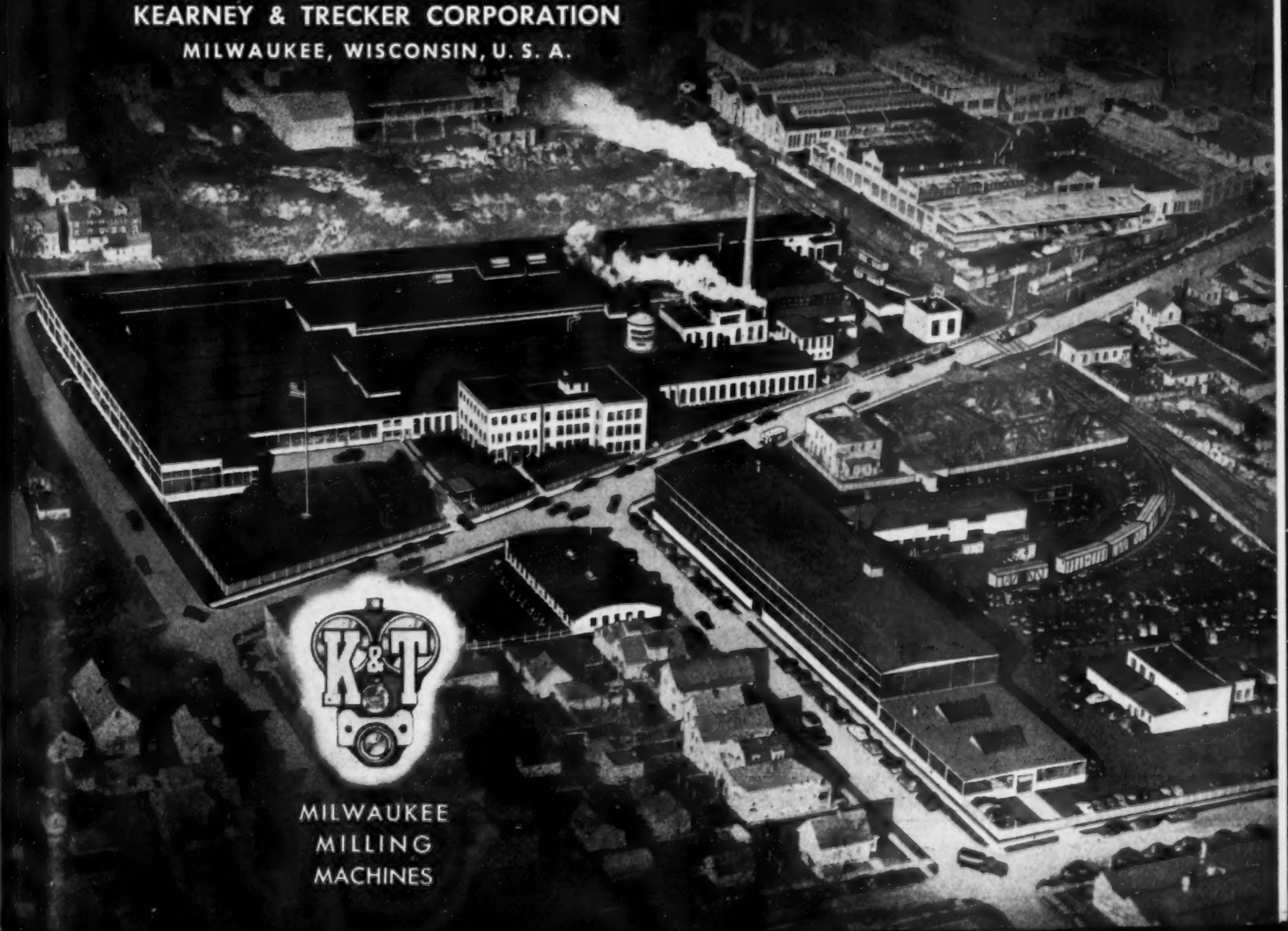
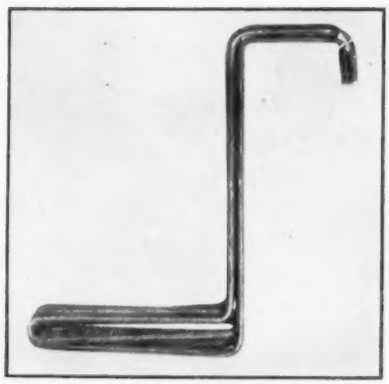


aluminum percentage at the surface sufficiently to permit scaling. Even at temperatures of 2,012 F. and over, the penetration is slow enough to give considerable protection, particularly if the article is in the heat for only short periods. The process is recommended for protecting such equipment as carburizing boxes and pots, annealing boxes, trays and covers, furnace parts, pyrometer tubes, salt and lead baths, ladles, cyanide heardening pots, furnace conveyors, and exhaust manifolds for gasoline and diesel engines.

Westinghouse "Corox" Heaters Designed for Oil Baths

A "Corox" immersion heater especially designed for oil tempering baths is announced by the Westinghouse Electric & Mfg. Co., Mansfield, Ohio. Made of steel tubing, these



heaters have a low watt density of approximately 11 watts per sq. in. of active tube surface. These heaters are available with an effective heating depth of either 5 or 10 in. The 5-in. units have a rating of 2,000 watts at 115 or 230 volts, and the 10-in. units have a rating of 4,000 watts at 115 or 230 volts. Any of these units may be connected in series on 440 volts.

Alemite "Lubriguards" Show When Bearing is Lubricated

The Alemite Div., Stewart-Warner Corp., 1826 Diversey Parkway, Chicago, Ill., has developed "Lubriguard" fittings and bushings for application to industrial machinery. These units are so constructed that they signal the operator when a bearing is sufficiently lubricated. The fitting is installed directly into the bearing. In operation with an Alemite hydraulic-type pressure gun applied to the fitting, the lubricant is forced through an inlet of the fitting and thence into the anti-friction bearing. When a predetermined amount of back pressure is developed in the bearing, excess lubricant appears at the vent, a signal to the operator that further lubrication is inadvisable. In making it impossible to cram anti-friction bearings with grease, these "Lubriguards" save the power loss, accelerated wear, repairs, and lubricant wastage that are direct consequences of over-lubrication. "Lubriguard" bushings make possible installations directly into bearings that already are equipped with conventional pressure gun fittings. Thus, bearings may receive "Lubriguard" protection without discarding the original fittings.

Binks Air-Driven Agitators Have Two Propellers

The Binks Mfg. Co., 3114-26 Carroll Ave., Chicago, Ill., has announced development of a complete line of propeller-type air-motor drive agitators for both open and closed type containers. The No. 939 series for open-type containers consists of two airplane-type propellers, one pitched right and the other pitched left, so that they "throw" towards each other, insuring good mixtures and preventing splashing. Being driven by an air motor, these agitators are suitable for use with liquids where there is an explosion hazard. The shaft can be from 12 to 27 in. long. The No. 636 series, consisting of an agitator drive, is for closed-type barrels which have their own agitating mechanism.

Stanley Armor Clad Tips Made for Soldering Irons

A line of armor clad soldering tips has been developed by Stanley Tools, New Britain, Conn., for their screw tip and plug tip electric soldering

irons. The armor clad tip is a copper tip having a thin special metal coating. By using this protective coating, the high heat conducting value of copper is retained and the copper tip is protected from rapid oxidation and corrosion. The tips can be tinned readily, but this is not necessary so frequently as with plain copper tips.

Lincoln Faceweld Electrodes Are Abrasion-Resisting

Faceweld No. 1 and No. 12 hard facing electrodes announced by the Lincoln Electric Co., 12818 Coit Rd., Cleveland, Ohio, are cast abrasion-resisting alloys used for hard-facing by the metallic arc process. Both are coated electrodes, having good arc characteristics and produce a smooth, dense deposit. Deposits are highly resistant to abrasion, but not excessively hard and brittle. "Faceweld" bonds well with all types of ferrous alloys.

Faceweld No. 1 is a general purpose hardfacing electrode which has good abrasion resistance and high resistance to impact. Faceweld No. 12 is somewhat harder than Faceweld No. 1 and has superior resistance to abrasion. Its resistance to impact is high for this type of material, but not quite as high as Faceweld No. 1. The hardness of these electrodes will vary somewhat, depending upon the conditions under which they are deposited, but in general they show practically their full hardness in the as-deposited state, heat-treatment does not materially affect their hardness. Both electrodes are furnished in ¼ in. size, 12-in. long.

Abrasive "Silver Streak" Disk Withstands Heat of Grinding

The unusual heat resistance claimed for the "Silver-Streak Insulated" grinding disk made by Abrasive Products, Inc., South Braintree, Mass., is said to result from the use of a binder developed by the company. Unlike ordinary glue which quickly softens and destroys the disk as heat is generated, this binder stays firm and holds grits in cutting position at temperatures up to 1,800 F. In one test, the improved disk completed 32 units of work where other type disks were capable of only 17 units.

Olixir Oil Conditioner Available in Small Sizes

The Model K-1 "Kralinator" oil conditioner offered by Olixir Products Co., 887 Niagara St., Buffalo, N. Y., follows the same design as the line of larger sizes which have found use as standard and special equipment on

The New "TOM THUMB" PIPE THREADER

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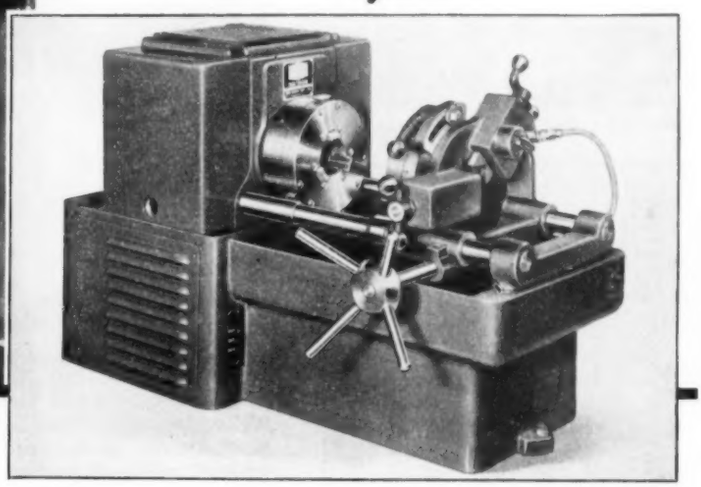
Study these modern features



1. MODERN DESIGN—all BALL BEARING construction.
2. COMPLETE RANGE—1/2" to 2"—up to 8" with drive shaft.
3. DIE-HEAD—quick-opening, fully adjustable—heavily built.
4. DIES—High Speed Steel.
5. CUT-OFF DEVICE—High Speed Steel, lathe type tool with V Block steady rest.
6. REAMING AND CHAMFERING DEVICE—High Speed Steel forming tool does both operations at the same time.
7. TWO CHUCKS—front chuck, bar operated, three jaw, gripping—rear chuck, three jaw, wheel operated, centering. Both chucks, quick acting.
8. MOTOR—Black & Decker, 1/2 H.P. universal, reversible, variable speed—light socket operation.
9. WORM GEAR DRIVE—hardened and ground, steel worm with bronze worm gear.

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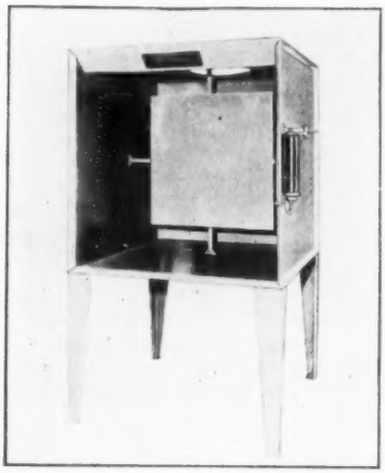
industrial units, trucks and tractors. "Kralinator" oil conditioners feature a replaceable, impregnated conditioning element for separation of foreign matter from lubricating oil. This element will remove water, harmful acids, carbon sludge and varnish forming substances.

Westinghouse Infrared Lamps Designed for Heating

The Westinghouse Lamp Division, Bloomfield, N. J., has announced four infrared drying lamps in 250 to 1,000 watt sizes for industrial or commercial drying and heating jobs. The line includes a 250-watt lamp with pear-shaped clear glass bulk and medium screw base; a 250-watt reflector drying lamp in the inside-frosted R-40 bulb, also with medium screw base; and 500 and 1,000-watt lamps in clear glass globular bulbs, both with medium and bipost bases for heavy-duty work. All are designed for use on 105 to 120 volt circuits. With the exception of the reflector drying lamp, all should be used in conjunction with especially designed aluminum or gold plated reflectors.

Binks Small Spray Booths Have Interchangeable Panels

Made in one size only, 3½ ft. wide, high and deep, the small spray booths offered by Binks Mfg. Co., 3114-26 Carroll Ave., Chicago, Ill., have interchangeable panels so that



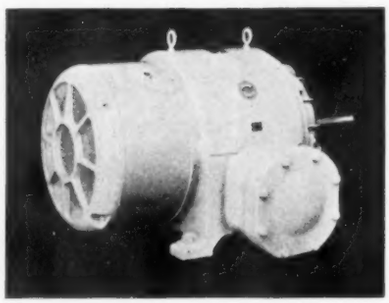
the exhaust can be run out of top, side or back of booth, as desired. A line of 15-in. diameter exhaust fans has been designed for use with these booths. The booth can be obtained with or without 31-in. legs which are shown in position.

Cutler Hammer Contactors Have Efficient Blow-Out

The No. 540 line of d.c. heavy-duty contactors offered by Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis., are available in 100, 150, 300, 600, 1200 and 1800 amp. sizes. This line of contactors features a new high-frequency type arc blow-out which quickly drives the arc from the contacts to the large arc horns above the contacts. The heavy-duty arc shields with Carbofrax inserts opposite the contact tips are easily lifted off for inspection. Design and construction of the electric interlock are said to eliminate contact troubles. The rollers which actuate the mechanism are made of bakelite.

Explosion-Proof Motors Available in Large Sizes

Higher horsepower explosion-proof motors are offered by U. S. Motors, Inc., Dept. 23, 80-34th St., Brooklyn, N. Y. In Class I, Group D, explosion-proof motors, approved by National Board of Fire Underwriters, the rat-



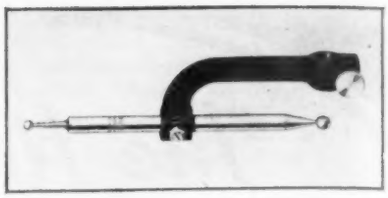
ings have been increased from 25 to 75 hp., while in Class II, Group G, they have been increased from 7½ to 75 hp. The larger motors are of the shell-type frame construction and have a fan which is claimed to be quiet even at high speeds.

Weltronic Glow Tube Meter Measures Welding Currents

The glow tube meter announced by Weltronic Corp., 2832 East Grand Blvd., Detroit, Mich., provides a convenient means of measuring welding current and voltages of such short duration as one cycle on a 60-cycle circuit. The instrument also can be used to measure continuous current flow and voltages. The instrument will measure any current from 50 to 50,000 amp., and voltages from 0.5 to 550 volts on a 60-cycle circuit where the current or voltage wave is approximately sinusoidal in character. It can be used with circuits of other than 60 cycles by using a corrective factor.

B. & S. Hole Attachments Used on Dial Indicators

Designed for use on dial indicators having 0.375 in. diameter stems, the Nos. 729C and 729D hole attachments adapt indicators for testing



internal and other surfaces which cannot be reached with the spindle of the dial gage. They are attached easily. Attachment No. 729C will enter a hole to a depth of 1$\frac{1}{8}$ in., while attachment No. 729D has a shorter arm and is suited for use in shallow holes, or for rough grinding and boring operations. Arm of No. 729D attachment will enter a hole to a depth of $\frac{13}{16}$ in.

Preis Master Copy Type Made of Plastic Material

Intended for producing steel letter stamps, type, and various classes of dies, master copy type made of durable plastic materials is offered by H. P. Preis Engraving Machine Co., 157 Summit St., Newark, N. J., for three-dimensional pantographic engraving and die-cutting machines. This type is furnished in heights of $\frac{5}{32}$, ¼ and ½ in. and in eight variations of width, from very condensed to very extended. The face of the character is formed with a double bevel, the lower being 20 deg. from the center line and the upper 35 deg. Because of the steepness of the lower bevel, the base of the character is relatively narrow, thus permitting close spacing. For ease of lining up, a stud projects from the back of each character. The characters are shaped so as to permit the cutting of sharp inside corners in minimum time.

NEW MATERIALS

"Talide" Carbides Made In All Practical Shapes

Metal Carbides Corp., 107 E. Indianola Ave., Youngstown, Ohio, has announced that "Talide" tungsten carbides now are available in practically any length, diameter or size, and in all practical shapes, such as strips, rods, bars, tubes and rings. Pieces larger than 100 lb. now can be produced. Strips, rods and bars in single lengths of 16, 24 and 48 in. are being made for a variety of wear-resisting applications. Solid tungsten carbide rolls have been developed for use in cold rolling mills for rolling carbon, stainless and alloy strips in widths up to 16 in. Also, special shaped forming dies and punches are being made for compressing powdered iron parts, bronze bearings and ceramics for a variety of applications.

TRADE PUBLICATIONS

ABRASIVE CUTTING Catalog No. 302, issued by the Andrew C. Campbell Div. of American Chain & Cable Co., Bridgeport, Conn., discusses a line of abrasive cutting machines.

BAR STEEL La Salle Steel Co., Box 6800 A, Chicago, Ill., has published an 8-page illustrated bulletin telling "Why Stressproof No. 2 Cold Finished Steel Bars are Being Used in Over 500 Applications."

BEARINGS Bulletin IV-7, issued by New Departure Div., General Motors Corp., Bristol, Conn., discusses applications of precision ball bearings to horizontal boring and milling machine headstocks.

BEARINGS Extensive engineering data concerning a line of staggered roller bearings is provided in a 16-page illustrated bulletin offered by Orange Roller Bearing Co., Orange, N. J.

BOLTS Catalog No. 13, published by St. Louis Screw & Bolt Co., 900 N. Broadway, St. Louis, Mo., contains 72 pages of specifications of an extensive line of nuts, bolts, screws and washers.

CIRCUIT BREAKERS Features of No. FK-142 25,000-kva. oil circuit breakers are provided in a leaflet, No. GEA-3282, issued by General Electric Co., Schenectady, N. Y.

COMPRESSORS Bulletin No. S-550-B17, issued by Worthington Pump & Machinery Corp., Harrison, N. J., provides eight pages of design and construction information concerning "Unibloc" gas engine compressors of 1 to 540 hp.

CONTOUR SAWING Continental Machines, Inc., 1310 Washington Ave., S., Minneapolis, Minn., has published another edition of its Contour Sawing Handbook. Priced at $1, it contains 160 pages of charts, data and other information, as well as 300 illustrations of applications of the contour sawing process.

ENGINES Type EEG vertical four-cycle totally enclosed gas engines are described in an 8-page illustrated bulletin, No. S-550-B15, published by Worthington Pump & Machinery Corp., Harrison, N. J.

FLAME CUTTING Features of the Model C "Flame-Shaper" are provided in a 4-page illustrated folder offered by Schrader-Bowers Co., 2629 Lincoln Way West, Mishawaka, Ind.

GEARING Philadelphia Gear Works, Philadelphia, Pa., has published a 64-page catalog covering its

WYCKOFF

COLD DRAWN STEEL BARS

checked and double checked for—

√ STRENGTH, HARDNESS, TOUGHNESS

√ EXACTING DIMENSIONAL ACCURACY

√ ABSOLUTE STRAIGHTNESS

√ PERFECTION OF SURFACE FINISH

Every length is the product of progressive scientific control from molten metal to finished bar—every length carries a complete record of its physical and metallurgical analysis.

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Mills at Ambridge, Pa. and Chicago, Ill. . . . Warehouse Stocks in Principal Cities . . . Manufacturers of Carbon and Alloy Steels . . . Leaded Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2"

For the life of the bearing

To take up bearings . . . to align or space parts . . . simply peel .002 or .003-inch laminations from the brass Laminum shim. Right at the job . . . no filing, grinding, miking. Speed, accuracy and cost-saving in factory and field service adjustments! • *Shims cut to your specifications . . . stock shim materials carried by your mill supply distributor.*

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line of single, double and triple reduction herringbone speed reducing units. Dimensional drawings of the reducers and of a line of base plates are included, as well as descriptions of several types of couplings and a number of other Philadelphia products.

GRINDERS Specifications of the "Hi-Power" line of grinders, sanders, buffers, motors and accessories is provided in a 16-page illustrated catalog, No. A-39, published by Sawyer Electrical Mfg. Co., Los Angeles, Calif.

HEAT-TREATING Specifications and illustrations of an extensive line of "Amsco" alloy heat-treating containers are provided in an 8-page bulletin issued by the American Manganese Steel Div. of American Brake Shoe & Foundry Co., 389 E. 14th St., Chicago Heights, Ill.

HOLLOW SCREWS Allen Mfg. Co., Hartford, Conn., has published a 20-page catalog, No. 39, describing various uses of its hollow screw products and including detailed specifications.

INSTRUMENTS Features and applications of the Rockwell-Bristol dilatometer are provided in a 4-page illustrated bulletin, No. 546, issued by the Bristol Co., Waterbury, Conn.

LABELING "Problems Under Informative Labeling," a 23-page discussion of the situation, comprises a booklet published by the American Management Association, 330 West 42nd Street, New York, N. Y. Price, 50 cents per copy.

LIGHTING Wiremold Co., Hartford, Conn., discusses features of a line of industrial lighting fixtures in its folder entitled "New Ways to Speed Work . . . Reduce Rejections . . . Cut Costs."

LUBRICATION Bulletin J, issued by Bijur Lubricating Corp., Long Island City, N. Y., provides 14 reasons for the "why" of automatic lubrication.

MAINTENANCE Porter Cable Machine Co., 1712 N. Salina St., Syracuse, N. Y., has issued a 24-page booklet listing various types of equipment for industrial floor maintenance.

MASONRY DRILL A chart issued by Dept. MD, Carboloy Co., 11149 E. Eight Mile Rd., Detroit, Mich., gives correct sizes of masonry drills, for use with 36 well-known makes of expansion anchors and shields of various sizes.

MATERIALS HANDLING Design and construction features of the "American" line of pressed steel trucks and industrial truck wheels are provided in a 20-page illustrated catalog, No. T39, issued by American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa.

METCOLIZING Bulletin No. P-11, published by Metallizing Engineering Co. Inc., 21-07 41st Ave., Long Island City, N. Y., describes the "Metcolizing" process for protecting metal parts exposed to heat.

METAL CUTTING The A.S.M.E. "Manual on Cutting of Metals" contains 300 pages of information on speeds and feeds for various cuts in machining all common alloys and steels in ordinary use. It is published by the American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y. Copies are available for $5.00 each.

METAL SAWING Porter-McLeod Machine Tool Co., Hatfield, Mass., provides 4 pages of information and specifications concerning its 8-in. cold metal sawing machine in a 4-page illustrated folder.

MILLING Features and applications of the "Rusnok" vertical milling attachment are provided in a 4-page illustrated folder available from Lockwin & Co., 205 W. Wacker Drive, Chicago, Ill.

MOTOR BASE "American" tension-control motor bases are described in a 16-page illustrated bulletin, No. MC38A, issued by American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa.

MOTORS Leaflet No. GEA-98B, issued by General Electric Co., Schenectady, N. Y., discusses features and characteristics of the Type RB single-phase, repulsion, brush-shifting motor.

MOTORS Emerson Electric Mfg. Co., Louis, Mo., has issued a 4-page mailing folder, No. X-3558, describing its line of stock motors of 5 hp. and smaller.

PACKAGING "Recent Developments in Packaging Progress," a 32-page symposium of discussions by various authorities in the field, has been made available by the American Management Association, 330 W. 42nd St., New York, N. Y. Price, 50 cents per copy.

PLANER DRIVE Bulletin No. GEA-3292, issued by General Electric Co., Schenectady, N. Y., contains 4 pages discussing features of a constant-voltage type reversing planer drive.

PULLEYS American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa., has issued two catalogs describing its line of pulleys. No. P-39 provides 12 pages of information concerning the "American" line of steel

split pulleys, while the other provides 4 pages of data on "Sprucolite" motor pulleys.

PUMPS Worthington Pump & Machinery Corp., Harrison, N. J., discusses design features and provides engineering data of a line of balanced "Monobloc" centrifugal pumps in a 4-page illustrated folder, No. W-322-B1D.

REBUILT MACHINERY Bulletin No. 104-S, issued by J. L. Lucas & Son, Inc., 3 Fox St., Bridgeport, Conn., contains 8 pages of information giving specifications of a line of new and rebuilt machine tools.

RELAYS General Electric Co., Schenectady, N. Y., provides 20 pages of information concerning over-current, under-voltage, auxiliary, instantaneous and time plunger type relays, in Bulletin No. GEA-1811B.

REMOTE CONTROL Bulletin No. RC4, published by the Tomkins-Johnson Co., 615 N. Mechanic St., Jackson, Mich., contains 12 pages of design data and engineering information concerning the line of T-J pneumatic remote control systems.

SAFETY The September, 1939, list of appliances inspected by Underwriters' Laboratories relates to accident hazards, automotive equipment and burglary protection. Copies are available from the Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill.

SAFETY "The Steel-Grip" line of safety clothing is outlined in a folder issued by Industrial Gloves Co., 701 Garfield Blvd., Danville, Ill.

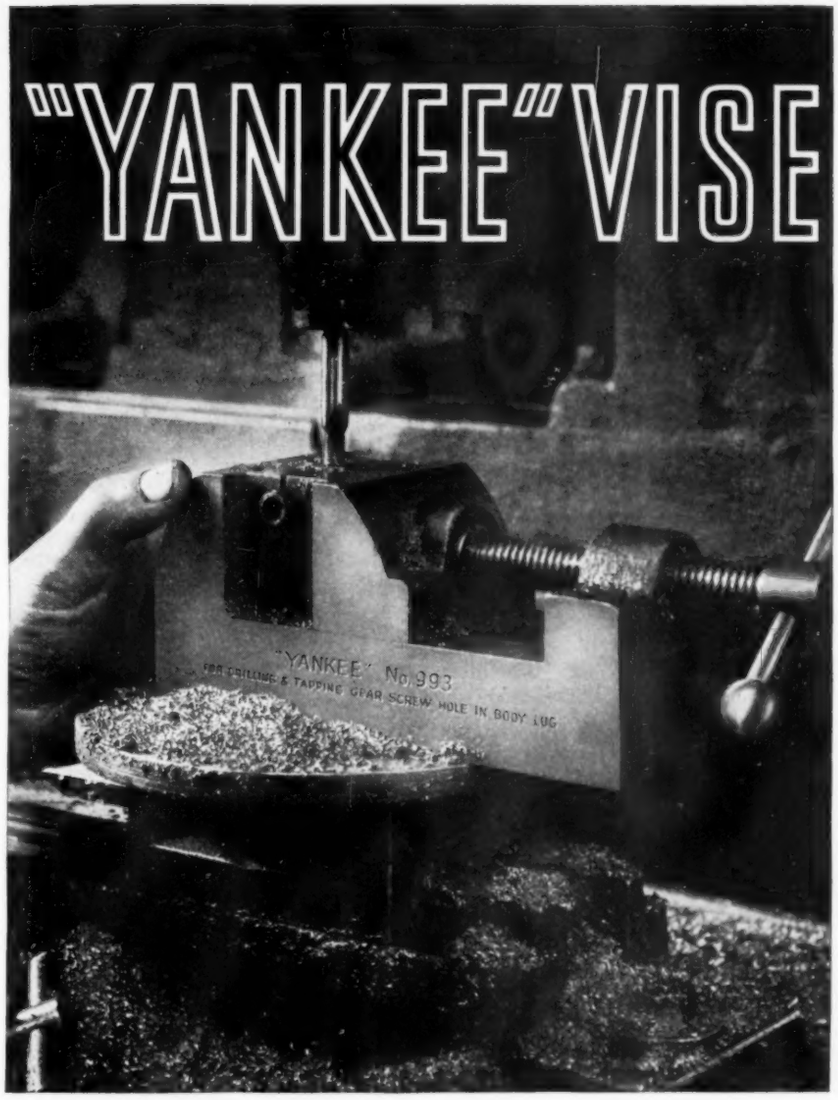
SCREW STOCK Jones & Laughlin Steel Corp., Pittsburgh, Pa., has issued a 4-page illustrated folder discussing the influence of Bessemer flame control on cold finished screw stock quality.

SHAPERS The Rockford Machine Tool Co., Rockford, Ill., offers a circular describing improved 16- to 28-in. "Hy-Ddraulic" shapers in which extensive internal changes have been made.

SHIPPING American Management Association, 330 W. 42nd St., New York, N. Y., has made available, for 75 cents each, copies of a 40-page booklet entitled "Improved Methods in Packing and Shipping."

SOCKET SCREWS A catalog published by the Mill Supply Division of the Bristol Co., Waterbury, Conn., provides features and specification of "Bristo" socket screw products.

STAINLESS STEEL "Design," an 8-page illustrated booklet issued by Carpenter Steel Co., 109 W. Blon St., Reading, Pa., discusses physical prop-



"YANKEE" VISE

"YANKEE" VISE No. 993 CONVERTED INTO DRILLING AND TAPPING JIG

For accuracy and speed in handling—add "Yankee" Vises to your shop equipment. Accurately machined—sides, ends and base, the "Yankee" Vise holds work square on face plate or machine bed. Vise illustrated at right, made in four sizes: No. 991; 1½" jaw width. No. 992; 2" jaw width. No. 993; 2¾" jaw width. No. 994; 4" jaw width. "Yankee" Vise also available with removable swivel base. Sizes: Nos. 1991, 1992, 1993 and 1994.

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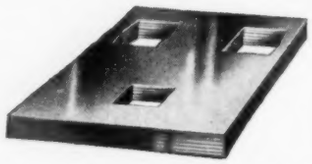

DeVilbiss Company of Toledo formerly jig sawed these Perfume Racks separately from C. R. Brass, each rack requiring 1½ hours. On the DoAll, they now stack 6 or more pieces, solder corners to hold them firm and saw them at one time, saving 1 hour and 24 minutes on each rack.

STARTLING RESULTS

Contour Sawing, the new DoAll process of machining is recognized as the fastest precision method of removing metal; cuts out internal and external shapes from any metal up to 10" thick.

Does work of 3 machines. DoAll is a moderately priced, rugged precision machine tool that replaces shaping, milling and lathe work on a large variety of jobs with enormous savings.

Used in large and small plants in 30 countries by such firms as General Instrument, Lincoln Engineering, Picatinny Arsenal, Baldwin Locomotive, Ford, General Electric, Ace Tool & Die, Penn Electric Switch, Canadian National Railways, Remington Rand, etc.

Let a factory trained man bring a Do-All to your plant and show you what it does, what it saves on your own work.
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FREE —
New Handbook on Contour Machining—158 pages of valuable metal working helps.

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☐ Send data on the DoAll AM-4
☐ Send Free Handbook

Name.....

Address.....

erties of a line of stainless steels and reveals their effect on product design.

SUPPLIES "Houghton Products for the Metal-Working Industries," a 24-page illustrated booklet issued by E. F. Houghton & Co., Third, American and Somerset Sts., Philadelphia, Pa. Contains data on cutting oils, carburizers, heat-treating salts, inhibitors and other supplies.

SWITCHES Characteristics and specifications of a line of steel discharge switches are provided in a four-page illustrated folder, No. GEA-3281, issued by General Electric Co., Schenectady, N. Y.

SWITCHES Features of a line of rotating-cam switches are included in an eight-page bulletin, No. GEA-2230A, issued by General Electric Co., Schenectady, N. Y.

TAPPING R. G. Haskins Co., 2760 W. Flournoy St., Chicago, Ill., has published a chart showing tap drill sizes and percentages of threads. It is claimed to be more complete than the usual tap drill chart.

THERMOPLASTICS Tennessee Eastman Corp., Kingsport, Tenn., has issued three new books giving the latest information on the uses, molding and specifications of "Tenite" thermoplastic molding compositions. Designers and molders of plastic products will find much of value in these books.

THREADING Twenty-four pages of information are provided in an illustrated catalog, entitled "Acme Modern Threading Machines," published by Acme Machinery Co., 4535 St. Clair Ave., Cleveland, Ohio.

THREAD-GRINDING Three bulletins issued by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich., describe three thread grinding machines recently made available. Bulletin 14191 discusses the Style No. 50 machine for accurate grinding of long threads; Bulletin 14091 discusses the Styles No. 33 and 33L precision thread grinders; while Bulletin 14291 deals with Style No. 39 internal precision thread grinder.

TOOLBITS An 8-page illustrated folder offered by Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y., contains information on the use of "Rexalloy" toolbits.

TOOLBITS An 8-page illustrated folder published by General Tool & Die Corp., 62 Franklin St., East Orange, N. J., provides specifications of a line of "Vascoloy-Romet" tipped cutting tools.

TOOLBITS Designs and specifications of "Rexalloy" tipped toolbits are included in a 4-page illustrated folder issued by General Tool & Die Corp., 62 Franklin St., East Orange, N. J.

TRANSFORMERS Bulletin No. GEA-3228, issued by General Electric Co., Schenectady, N. Y., illustrates fittings specially designed for Pyranol transformers.

UNIVERSAL JOINTS Design and engineering data concerning the "Atlas" line of universal joints are provided in a 4-page folder available from Gray & Prior Machine Co., 69 Suffield St., Hartford, Conn.

VOLTAGE REGULATORS Characteristics of Type GDA voltage regulators for a.c. generators, synchronous condensers and synchronous motors are provided in Bulletin No. GEA-3279, available from General Electric Co., Schenectady, N. Y.

WEIGHING "45,000 Ways to Weigh," a pictorial brochure now being distributed by Toledo Scale Co., Toledo, Ohio, contains over a hundred illustrations showing various industrial and commercial uses of many types of scales.

WELDING Allis-Chalmers Mfg Co., Milwaukee, Wis., illustrates uses of its "Weld-O-Tron" unit in different applications in Bulletin No. B-6049.

WELDING A 36-page illustrated pamphlet offered by Bastian-Blessing Co., 240 East Ontario St., Chicago, Ill., identified as Equipment Catalog No. R-155, provides features and specifications of the "Rego" line of welding and cutting equipment.

Lapping Over Shifts

Adding to a shop's capacity by putting on extra shifts isn't always as easy as it sounds. Those who remember the experiences of 25 years ago will recall several different kinds of troubles. Putting an extra shift on automatic, turret lathes or similar machines making parts is not difficult. The set-up remains the same and the operator simply takes over when the other man leaves. But in the assembling of large units, or complete assembly of a machine, is a different story.

For this reason some plants find it advantageous to have foremen and gang bosses lap over in hours. The new man comes on duty a half hour, or hour, before the previous shift goes home. In this way the incoming man is fully informed as to the state of the work. He knows what troubles, if any, had been encountered, what materials may be delayed, and other information that helps him to carry on without undue delay.

Straight-line Engines

By H. M. LANE

From 1885 to 1888, I worked for the M. C. Bullock Company, Chicago. Among the many lines turned out by this company were straight-line engines, as they were the western manufacturers for Prof. John Sweet.

The main frame of a straight-line engine was formed like a large letter *A*, with a crankshaft across the foot and the cylinder bolted to the top of the *A*. The engine was supported on three feet, one under each crankshaft bearing and one at the cylinder end.

The method of machining was planned for accuracy and duplication of parts.

When the frame casting came into the shop, the three places for the supports were first planed and the bearing caps fitted in place. The casting was then moved to a large cast-iron floor plate, where it was mounted on temporary legs or feet. A long boring bar was mounted on suitable supports and the crosshead guides bored. With the bar in the same position, the cylinder end of the frame was faced for receiving the cylinder. Next, a smaller boring bar was mounted at right angles and the crankshaft bearings bored. At the same time, other attachments were put in place to drill and tap the stud holes for attaching the cylinder, for forming the valve-stem hole and performing all other operations necessary for attaching the several parts to the frame. It must be remembered that at that date there were no small electric motors and no portable electric or pneumatic tools. All attachments were driven by endless round rawhide belts or ropes running in grooved wheels or sheaves. Power was taken from several sheave wheels mounted on counter shafts near the plate and each endless belt was kept tight by a weighted tightener pulley.

The way the work was laid out, the man in charge was kept comfortably busy setting up the equipment for one operation while another part was being machined.

Fixtures, jigs and gages were so accurate that I have seen a replacement frame shipped several hundred miles, and all parts assembled on it without any trouble.

One feature was the valve-stem bearing. There was no stuffing box or packing gland in connection with it. As already stated, the engine was a high-speed unit and Professor Sweet figured out how far steam at the pressure used could travel through the space between the valve stem and its sleeve during one stroke of the stem. He then made the sleeve, a carefully fitted babbit unit, just a little longer than the possible travel of the steam. As a result, the end of the sleeve was surrounded by condensed steam. No steam could pass, and no lubrication was necessary even at the high operating speed.

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Many Parts Almost Completed by Cold Drawing

Think what this can mean to you through reduced machining costs. In most applications a substantial percentage of the machining needed to obtain the shape from a standard round, square, hexagonal or flat bar is eliminated. In many cases no machining is required except cutting to length and minor operations such as drilling. With any part, the only shop work required is where the part deviates from its full cross-section. And there is no loss of metal in reducing the bar from standard shape to part cross-section.

Improved Physical Properties and Surface Finish

But those are not the only advantages of using Union Cold Drawn Special Sections. Your parts benefit from the increased physicals—the higher strength and greater hardness—and the bright, smooth surface produced by cold drawing. Thus, parts become stronger and longer-wearing—and, except in rare cases, the cold finished surface requires no further finishing.

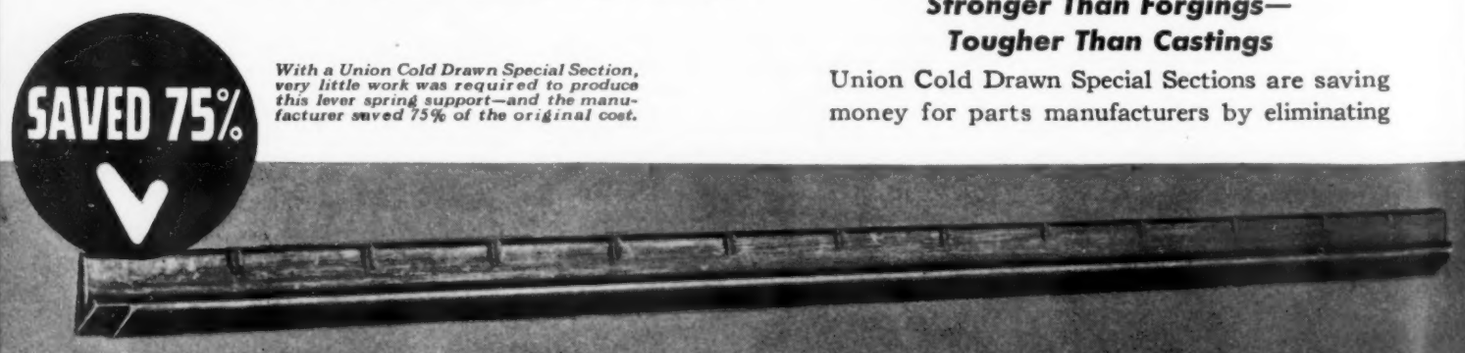
When made from a Union Cold Drawn Special Section, this part cost 69% less than when made in the customer's machine shop. Cutting from special section bar, drilling and tapping of holes finished the part.

Close Tolerances—High Accuracy

Union Cold Drawn Special Sections are uniformly accurate—because of cold drawing to close tolerances. Machinability, too, is improved, reducing the cost of such operations as may be necessary to complete the finished part.

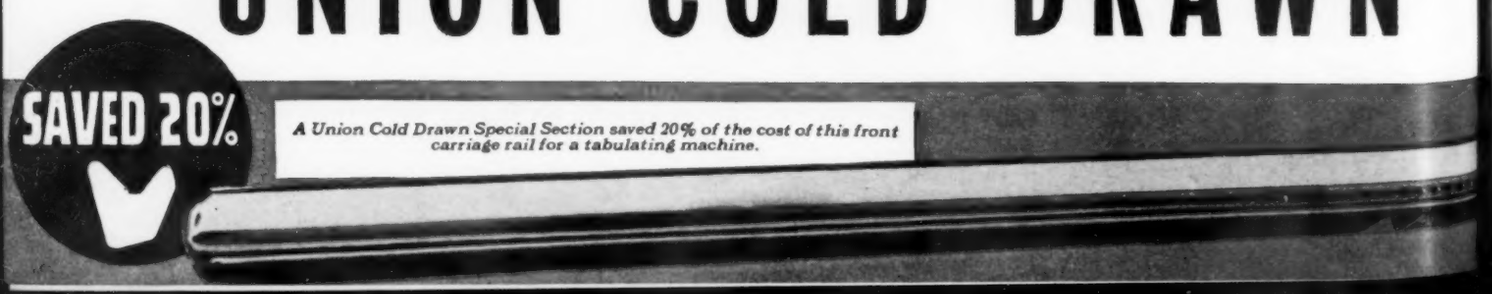
Stronger Than Forgings—Tougher Than Castings

Union Cold Drawn Special Sections are saving money for parts manufacturers by eliminating



With a Union Cold Drawn Special Section, very little work was required to produce this lever spring support—and the manufacturer saved 75% of the original cost.

UNION COLD DRAWN



A Union Cold Drawn Special Section saved 20% of the cost of this front carriage rail for a tabulating machine.